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REPORT ON MEDICAL ACTIVITIES FOR THE AUTOMATED AFEES PROGRAM

Automated AFEES System Program Office

March 1976

Prepared for

AUTOMATED AFEES SYSTEM PROGRAM OFFICE
HQ ELECTRONIC SYSTEMS DIVISION
HANSCOM AIR FORCE BASE, MA 01731

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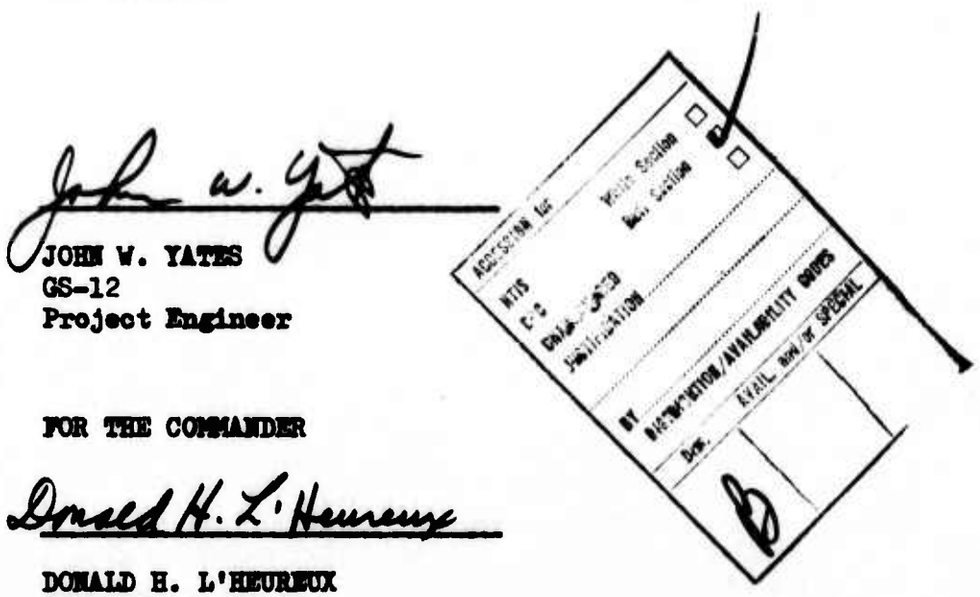

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Armed Forces Examining and Entrance Station (AFEES)
Military Health Statistics

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This report documents the approach, results and conclusions of all activities performed to satisfy medically related program management directives. Pertinent program direction includes requirements to investigate the selective application of automation to optimize examinee processing, establish a data base upon which meaningful management and scientific studies may be accomplished, determine the reduction possible in premature discharges attributable to screening process deficiencies, optimize the examining physician's time, and provide capability for adequate growth and flexibility to cope with changing workloads and

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changing medical, mental and administrative procedures. The medical intent of the above direction is further amplified in Program Memorandum dated 18 Oct 74, which required a medical data base, printing of SF 88 and SF 93, and operational procedures to provide integrity of medical data.

The report contains separate sections relating to medical hardware automation, medical processing optimization, medical data base design and development, optimization of physician's time, flexibility and growth considerations, psychometric screening, analysis of premature discharge due to screening process deficiencies, and a medical system analysis. A final section is included to discuss the overall medical section observations, conclusions and recommendations.

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INTRODUCTION

This report documents the approach, results and conclusions of all activities performed to satisfy medically related program management directives. Pertinent program direction includes requirements to investigate the selective application of automation to optimize examinee processing, establish a data base upon which meaningful management and scientific studies may be accomplished, determine the reduction possible in premature discharges attributable to screening process deficiencies, optimize the examining physician's time, and provide capability for adequate growth and flexibility to cope with changing workloads and changing medical, mental and administrative procedures. The medical intent of the above direction is further amplified in Program Memorandum dated 18 Oct 74, which required a medical data base, printing of SF 88 and SF 93, and operational procedures to provide integrity of medical data.

The report contains separate sections relating to medical hardware automation, medical processing optimization, medical data base design and development, optimization of physician's time, flexibility and growth considerations, psychometric screening, analysis of premature discharge due to screening process deficiencies, and a medical system analysis. A final section is included to discuss the overall medical section observations, conclusions and recommendations.

DESCRIPTION OF EFFORTS

Medical Hardware Automation

On-Line Automatic Medical Data Collection

In order to comply with the directive to selectively apply automation to optimize examinee processing, the program office established a capability to select, test and evaluate on-line medical data collection hardware for possible inclusion in the Automated AFEES system. Initial selection of hardware was provided by the United States Air Force Aerospace Medical Division, School of Aerospace Medicine (SAM), Brooks AFB, Texas. Initial evaluation of USAREC requirements, availability of commercial equipment, and experience with professional acceptance of newly designed medical equipment (SAM-developed Tone Count Audiometric Computer) led to the fundamental conclusion that all medical equipment must be off-the-shelf. The equipment procured for evaluation of potential use in Automated AFEES is shown in Table 1.

Table 1 Equipment Procured for Evaluation of On-Line Automatic Data Entry

MANUFACTURER	MODEL
Hoffman-La Roche, Inc.	Automatic Blood Pressure Monitor, Arteriosonde 1216 with transducer, cuff, cable and gell, P/N 1216-1
Tracor	ARJ-4B/AD Audiometer
Continental Scale Corp.	Electronic Height and Weight Scale, Model 502-DH

In order to integrate the hardware shown in Table 1, the Program Office procured a Programmable Data Mover-PDM 70 (Digital Equipment Corporation) and standard interface cards and cables. All software required to complete the integration was written by the Program Office in MUMPS-11. This language, developed jointly by Digital Equipment Corporation and Meditech Corporation, is a dialect of MUMPS (Massachusetts General Hospital Utility Multiprogramming Programming System.

In order to evaluate the hardware defined in Table 1, the Program Office simulated AFEES medical processing stations for height/weight, blood pressure and audio exams. Applicants were processed through each test sequentially and processing time was automatically recorded. In addition, accuracy, reliability and system resource impact were observed.

The most significant conclusion of this evaluation is that the use of commercial off-the-shelf medical equipment for on-line collection of biometric data is not cost justifiable. In order to provide automatic medical data collection, the on-line hardware, core and interface equipment would add approximately $60,000 alone to the baseline system. Related activities such as programming, system integration and documentation could easily add another $40,000. None of the standard benefits (reduced manpower, increased accuracy, reliability or maintainability, and improved applicant processing) were substantiated. In fact, the contrary was found to be true in many instances. For example, significant problems of data accuracy were encountered due to hardware malfunction or inherent design limitations. Typical observations of this nature occurred with consistent sticking of the applicant response switch for the audiometer and nonuniform and unrepeatable blood pressure measurements. Proper use of the cuff, electrode paste, and movement artifacts had significant impact on unreliable blood pressure readings.

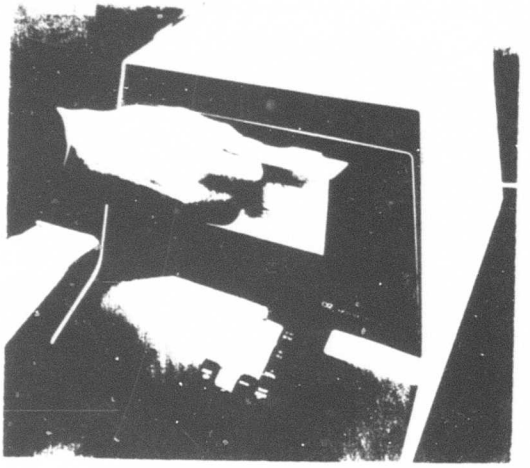
It should be noted that the equipment was basically designed for a hospital environment. This design is not compatible to an AFEES environment where many applicants are processed in a short time.

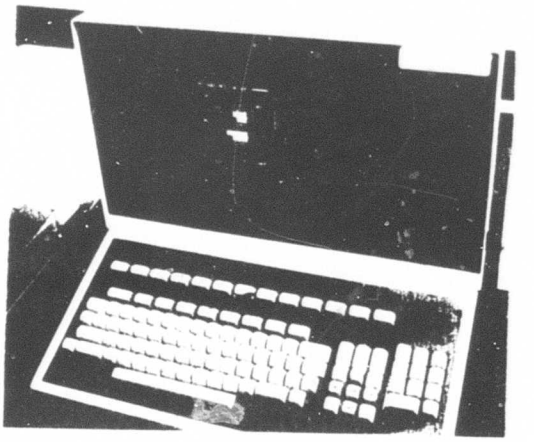
Slight manpower savings are possible when compared to the manual station which uses one technician to perform the measurements and another technician to record the data. Since the automatic hardware would only require one technician to perform both functions, it is possible to save one man-hour (25 minutes due to actual activities and 35 minutes allowed for delays) for a 100-man station.

On-Line Medical Data Collection

In order to collect medical data in computer-compatible format, all medical stations (except medical review) use a badge reader/ numeric keyboard (Figure 1A) as the basic data entry device. Under normal operation, a technician inserts an ID badge into the reader for identification. Once the badge is inserted, all medical data entered will be stored in an applicant specific data file. Technicians collect the data using conventional medical testing equipment and procedures and manually enter the applicant data into the system via the numeric keyboard on the badge reader.

After all medical measurements are recorded, an SF 88 (Medical Examination) is automatically printed for the applicant. A physician reviews the SF 88 with the applicant and then adds any free text necessary to complete the record, profiles the applicant and signs the SF 88. Once the interview is completed, a technician takes a copy of the SF 88 and updates the medical data base by entering the profile and any free text added by the physician. A CRT with alphanumeric keyboard (Figure 1B) is used to enter this textual data.





1A 1B

Figure 1A RT02 - Badge Reader/Numeric Data Entry

Figure 1B CRT - Visual Display/Alphanumeric Data Entry

Automation has introduced three new duties to the medical section, namely matching SF 88's and SF 93's with the correct applicants and entering free text data into the system.

Since the applicant does not carry an SF 88 with him during the examination, it is necessary to give the applicant his completed SF 88 prior to the physician interview. This has necessitated that a technician tear off the 88's and distribute them to the applicants. To date technicians have been able to perform this function and still perform their existing duties.

In order to obtain a data base on the results of medical histories, it is necessary to collect the mark sense SF 93's after the physician has completed his review, bring these SF 93's to another section for scoring, and then return them to the applicant prior to the final physician

review. This also has been accomplished with no significant delay on applicant processing.

Entry of free text data into the medical data base is the most significant duty added to the medical section. This function requires that a technician enter profile, disqualifying codes and physician's comments into the system after the physician has completed his review. A proper alignment of functions to speciality codes suggests that a medical typist be used for this function. The Baltimore AFEES does not currently have such a position, and to date the key medical technicians have been able to enter data at a speed that approximates a medical typist due to the time required to interpret some of the physician's handwriting and system response to the operator.

Operational evaluation of the Automated AFEES medical section has shown that there is no reduction in the number of technicians or physicians needed to process applicants. The three additional duties added because of automation have not required additional manpower or delayed the processing of applicants.

Medical Processing Optimization

Pre-All Volunteer Optimization Study

Initial efforts in optimization of medical processing was accomplished with computer simulation. A model of the Fort Jackson AFEES was developed using the General Purpose Simulation System (GPSS) computer language. Once verified, the model was modified to study the effects of various routing and loading techniques on the medical processing section. Emphasis was placed on determining the optimum order to complete various medical stations and a cost-effective way to regulate the loading on each station to obtain optimum throughput.

Two basic routing techniques (structured and unstructured) were investigated. Structured routing established a predetermined order of medical stations that an applicant must take. Unstructured routing let an applicant go to medical stations based on the current status of the system (queue lengths, average test time, etc.). Details of the study can be found in "Simulation of AMHT Units for Design Optimization," Proceedings of 7th Annual Simulation Symposium, 7:203- 218 (1974), by John Yates and Lieutenant Daniel Hammerstrom.

Observations made from the model were then analyzed in the frame-work of the current AFEES operations with particular emphasis on the Baltimore operation.

Observations made from the simulation study were: (a) When mass straight line processing is used, there is a slight improvement in medical processing time by placing long duration tests such as audio and orthopedics at the end of the testing sequence (3 hr, 42 min vs 3 hr, 37 min for 100 applicants). (b) Structured routing of applicants by groups provided a 10% savings in total medical processing time over mass straight line processing (3 hr, 37 min. vs. 3 hr., 15 min. for 100 applicants). (c) Unstructured routing of applicants provided a 17% savings in total medical processing time over mass straight line processing (3 hr., 37 min. vs. 3 hr., 00 min. for 100 applicants). (d) In all cases the hierarchy of improvements identified above only occurred when the medical workload approached the rated capacity (100 applicants) of the medical section. Significant increases or decreases in workload from rated capacity indicated no significant improvement for any optimizing approach utilized. (e) Optimization of Medical Section processing produced no improvement in total processing time because of other fixed processing requirements such as mental tests, medical history and enlistment processing.

Taken collectively, an unstructured routing of applicants could provide improvement in medical line processing when workload approaches rated capacity. Further, this improvement could translate into overall throughput improvement if activities that collect all applicants together, such as mental testing and medical history collection, only occur before medical processing or are eliminated.

All Volunteer Optimization Study Extension

Since the completion of the simulation study, AFEES processing has changed from a mobilization to an all volunteer environment and HQ USAREC has instituted mental testing and limited medical history collection in the field, streamlined the forms requirements for AFEES, and changed the test site to the Baltimore AFEES.

When the simulation results are analyzed with the above changes, the following observations can be made:

The Baltimore AFEES as a general rule keeps the long duration tests last and uses a manual unstructured routing; i.e., they move groups of applicants to available technicians to complete needed tests or increase number of technicians when particular lines cause delays. This approach is made possible by the diligence of the technicians and the layout of the facilities. With this flexibility, the medical processing is optimum even on days when there is a shortage of technicians. Accordingly, there is little or no improvement in medical processing time that could be gained by automating or changing the current medical operation in the Baltimore AFEES. For those AFEES that appear to have inefficient medical processing, careful consideration of facility improvements and manual implementation of unstructured routing techniques should provide a substantial improvement.

Medical Data Base Design

Introduction

Firm requirements for the Automated AFEES were to establish a medical data base and print the SF 88 and SF 93. No definition was provided as to content, extent or intended use of the data base once established. The first effort undertaken was a review of medical data already collected with an aim toward establishing its relevancy and usefulness in a clinical evaluation of an applicant. Once the review was completed, the Program Office firmed up the requirements of the actual data base and its implementation.

Review of Clinical Evaluation Standards

The first factor to be determined was the scope of the physical exam expected from the Automated AFEES. Prior to the "All Volunteer Force" concept, the physical exam was given in a wartime environment and as such was geared toward minimum acceptable requirements to obtain a fighting force (basically foot soldier). The "All Volunteer Force," many non-combatant jobs, and professional military (20 years retainability) pose serious medical questions as to the usefulness of the existing exam.

With the "All Volunteer Force," applicants are retained for a longer period of time and may be more inclined to make the military a career. In this context, a more thorough physical exam and history taking effort would be required to insure that the applicant has a better chance to remain in the service. In addition, it would provide the initial data base needed to allow ongoing surveillance and treatment programs. One specific example was the development of a more detailed medical history. This history, which contained detailed questions based on the SF 93, would discriminate between significant and trivial symptoms, e.g., normal head-

aches vs. those associated with tumor or vascular disease.

A second issue that questioned the usefulness of the existing exam was the continued requirement to have non-combatant jobs in the military. For example, a computer operator can perform his job even if he has flat feet or is overweight. Thus, although there are specific requirements for key jobs like pilot, the more common jobs utilize general standards that can be restrictive based on job assignment.

Both of the above examples center on the standards to be used for medically qualifying applicants into the service and their resolution was essential to the direction of the entire medical effort. Accordingly, the above issues were briefed to the USAREC Surgeons and OSD/DDR&E in October 1973. As a result of these briefings, it was established that the Automated AFEES (a) could not change existing medical standards or introduce new standards operationally and (b) existing groups within HQ USAREC and the Automated AFEES Advisory and Support Group were evaluating the issue of medical standards.

In addition to the above, the concept of a detailed medical history was briefed to HQ USAREC operational personnel on 19 Sep 74. HQ USAREC presented valid objections based on substantial increase in workload and questionable usefulness of the data once collected. In the absence of a firm requirement to change standards and because of serious impact on medical processing operations, efforts on the detailed medical history were terminated on 8 Nov 74.

Development of the Medical Data Base

The medical data base for the Automated AFEES contains those items necessary to complete the SF 88 and SF 93 and to develop medical statistics. Included in this definition is the capability to (a) flag out-of-tolerance medical findings

according to AR 40-501 and store the results, (b) distinguish between abnormal and disqualifying clinical evaluation and history results and record and store the data, (c) collect, print and store physician free text comments, and (d) develop a Medical Summary Report.

In order to collect this data base in analysis form, all data had to be coded. SF 88 entries (Block 44 through Block 72) are entered as necessary via a badge reader/data entry device after conventional medical measurements are made.

For clinical evaluation data (SF 88, Block 18 through Block 43), it was necessary to develop a coding structure with sufficient depth to capture the more common abnormalities. The final codes used are shown in a codebook (Appendix A). When these codes are entered, the system automatically prints appropriate textual comments on the SF 88 and records the number of abnormalities for statistical analysis. In order to facilitate the operational mechanics of data entry, a one- page worksheet (Figure 2) was developed for use at the Baltimore AFEES.

Medical history data is collected via a mark sense version of the SF 93 (Figures 3 and 4). This mark sense SF 93, developed jointly by the Program Office and Computer Sciences Corporation (CSC), is completed by the applicant and the physician or his designated representative. The mark sense SF 93 is automatically read and applicant "yes" answers and their impact on processing (the column labeled "P") is recorded for statistical purposes. The mark sense SF 93, when signed by the applicant and physician, becomes the permanent history record.

The basic outputs of the automated medical system are the SF 88, SF 93 (if desired) and the Medical Summary Report. The Medical Summary Report (Figures 5 and 6) is produced daily and

AFEES CLINICAL EVALUATION WORKSHEET

Applicant's Gummed Label

____ ALL NORMAL

	NORMAL	ABNORMAL	ABNORMALITY		DISQUAL.
EYES	___	___	Specify_____	Code____	___
EARS	___	___	__Scarring 23.20 __ Perforation 23.40 __Redness 23.60 __Drainage 23.70 __Other (Specify)_____	__Right __Left Code____	___
MOUTH					
THROAT	___	___	__Braces 21.36 Other_____	Code 21.	___
HEAD	___	___	__ Specify_____	Code____	___
FACE	___	___	__ Specify_____	Code____	___
NECK	___	___	__ Specify_____	Code____	___
SCALP	___	___	__ Specify_____	Code____	___
NOSE	___	___	__ Specify_____	Code____	___
	___	___	__ Specify_____	Code____	___
LUNGS	___	___	__Wheezes 28.50 __Other (Specify)_____	Code 28.	___
HEART	___	___	__Murmurs 29.50 __Other (Specify)_____	Code 29.	___
ABDOMEN/ GENITALIA	___	___	__Hernia 31.70 __Absent Testicles 34.13 __Undescended Testicles 34.14 __Other (Specify)_____	__Right __Left Code____	___
RECTUM	___	___	__Hemorrhoids 32.10 __Other (Specify)_____	Code____	___
UPPER, LOWER EXTREMITIES/ FEET/SPINE	___	___	__Missing Fingers 35.40 __Missing Toes 36.10 __Flat Feet 36.20 __High Arches 36.50 __Scoliosis 38.11 __Other (Specify)_____	Code____	___
SKIN	___	___	__Rash 40.10 Describe_____ __Needle Marks 40.40 Describe_____ __Scars 39.20 Describe_____ __Tattoos 39.30 Describe_____ __Acne 40.50 __Other (Specify)_____	Code____	___
VASCULAR/ ENDOCRINE/ NEUROLOGICAL	___	___	Specify_____	Code____	___
PSYCHIATRIC	___	___	Specify_____	Code 42.	___
PELVIC	___	___	Specify_____	Code 43.	___

Figure 2 Clinical Evaluation Worksheet

REPORT OF MEDICAL HISTORY

(THIS INFORMATION IS FOR OFFICIAL AND MEDICALLY-CONFIDENTIAL USE ONLY AND WILL NOT BE RELEASED TO UNAUTHORIZED PERSONS)

1 LAST NAME - FIRST NAME - MIDDLE NAME

2 HOME ADDRESS (No. Street or R.F.D., city or town, State, and ZIP CODE)

4 POSITION (Title, grade, component)

5 PURPOSE OF EXAMINATION

6 DATE OF EXAMINATION

7 EXAMINING FACILITY OR EXAMINER, AND ADDRESS (Include ZIP Code)

2 SOCIAL SECURITY NO

8 STATEMENT OF EXAMINEE'S PRESENT HEALTH AND MEDICATIONS CURRENTLY USED (Follow by description of past history, if complaint exists)

CONTINUE ON OTHER SIDE

9 HAVE YOU EVER (Please mark each item)

	Y	N	P
Lived with anyone who had tuberculosis			
Coughed up blood			
Bled excessively after injury or tooth extraction			
Attempted suicide			
Been a sleepwalker			

10 DO YOU (Please mark each item)

	Y	N	P
Wear glasses or contact lenses			
Have vision in both eyes			
Wear a hearing aid			
Stutter or stammer habitually			
Wear a brace or back support			

11. FEMALES ONLY HAVE YOU EVER

	Y	N	P
Been treated for a female disorder			
Had a change in menstrual pattern			

12 HAVE YOU EVER HAD OR HAVE YOU NOW

(Mark each item)	Y	N	?	P
Scarlet fever, erysipelas				
Rheumatic fever				
Swollen or painful joints				
Frequent or severe headache				
Dizziness or fainting spells				
Eye trouble				
Ear, nose, or throat trouble				
Hearing loss				
Chronic or frequent colds				
Severe tooth or gum trouble				
Sinusitis				
Hay fever				
Head injury				
Skin diseases				
Thyroid trouble				
Tuberculosis				
Asthma				
Shortness of breath				
Pain or pressure in chest				

(Mark each item)	Y	N	?	P
Chronic cough				
Palpitation or pounding heart				
Heart trouble				
High or low blood pressure				
Cramps in your legs				
Frequent indigestion				
Stomach, liver, or intestinal trouble				
Gall bladder trouble or gallstones				
Jaundice or hepatitis				
Broken bones				
Tumor, growth, cyst, cancer				
Rupture/hernia				
Piles or rectal disease				
Frequent or painful urination				
Bed wetting since age 12				
Kidney stone or blood in urine				
Sugar or albumin in urine				
VD—Syphilis, gonorrhea, etc				
Recent gain or loss of weight				

(Mark each item)	Y	N	?	P
Arthritis, Rheumatism, or Bursitis				
Bone, joint or other deformity				
Lameness				
Loss of finger or toe				
Painful or "trick" shoulder or elbow				
Recurrent back pain				
"Trick" or locked knee				
Foot trouble				
Neuritis				
Paralysis (include infantile)				
Epilepsy or fits				
Car, train, sea or air sickness				
Frequent trouble sleeping				
Depression or excessive worry				
Loss of memory or amnesia				
Nervous trouble of any sort				
Periods of unconsciousness				
Adverse reaction to serum, drug or medicine				

13 WHAT IS YOUR USUAL OCCUPATION?

14. RIGHT HANDED

	Y	N

MARK EACH ITEM YES OR NO. EVERY ITEM MARKED YES MUST BE FULLY EXPLAINED IN BLANK SPACE ON REVERSE SIDE.

	Y	N	P
15. Have you been refused employment or been unable to hold a job or stay in school because of			
A. Sensitivity to chemicals, dust, sunlight etc			
B. Inability to perform certain motions			
C. Inability to assume certain positions			
D. Other medical reasons (If yes, give reasons.)			
16. Have you ever been treated for a mental condition? (If yes, specify when, where, and give details.)			
17. Have you ever been denied life insurance? (If yes, state reason and give details.)			
18. Have you had, or have you been advised to have, any operations? (If yes, describe and give age at which occurred.)			
19. Have you ever been a patient in any type of hospital? (If yes, specify when, where, why, and name of doctor and complete address of hospital.)			
20. Have you ever had any illness or injury other than those already noted? (If yes, specify when, where, and give details.)			
21. Have you consulted or been treated by clinics, physicians, healers, or other practioners within the past 5 years for other than minor illnesses? (If yes, give complete address of doctor, hospital, clinic, and details.)			
22. Have you ever been rejected for military service because of physical, mental, or other reasons? (If yes, give date and reason for rejection.)			
23. Have you ever been discharged from military service because of physical, mental, or other reasons? (If yes, give date, reason, and type of discharge - whether honorable, other than honorable, for unfitness or unsuitability.)			
24. Have you ever received, is there pending, or have you applied for pension or compensation for existing disability? (If yes, specify what kind, granted by whom, and what amount, when, why.)			

Figure 3 Mark Sense Medical History Form - Side 1

8. STATEMENT OF EXAMINEE'S PRESENT HEALTH AND MEDICATIONS CURRENTLY USED CONTINUED

DETAILED EXPLANATION (ITEMS 15-24)

I certify that I have reviewed the foregoing information supplied by me and that it is true and complete to the best of my knowledge.
I authorize any of the doctors, hospitals, or clinics mentioned above to furnish the Government a complete transcript of my medical record for purposes of processing my application for this employment or service.

TYPED OR PRINTED NAME OF EXAMINEE	SIGNATURE

NOTE: HAND TO THE DOCTOR OR NURSE, OR IF MAILED MARK ENVELOPE "TO BE OPENED BY MEDICAL OFFICER ONLY."
25. Physician's summary and elaboration of all pertinent data (*Physician shall comment on all positive answers in items 9 through 24. Physician may also note any additional medical history he deems important, and record any significant findings here.*)

TYPED OR PRINTED NAME OF PHYSICIAN OR EXAMINER	DATE	SIGNATURE	NUMBER OF ATTACHED SHEETS

PREVIOUS EDITIONS OBSOLETE

Figure 4 Mark Sense Medical History Form - Side 2

M E D I C A L S U M M A R Y R E P O R T

Form: SF-88 12 FEB 76

Total Applicants Processed : 82

	MEDICAL ITEM	ABNL	DISQ		MEDICAL ITEM	ABNL	DISQ
18	Head,Face,Neck and Scalp	0	0	19	Nose	0	0
20	Sinuses	0	0	21	Mouth and Throat	1	0
22	Ears	0	0	23	Drums	0	0
24	Eyes	1	1	25	Opthalmoscopic	0	0
26	Pupils	0	0	27	Ocular Motility	0	0
28	Lungs and Chest	1	1	29	Hear	2	2
30	Vascular System	0	0	31	Abdomen and Viscera	3	3
32	Anus and Rectum	0	0	33	Endocrine System	0	0
34	G-U System	1	0	35	Upper Extremities	2	1
36	Feet	12	1	37	Lower Extremities	1	2
38	Spine,Other Musculoskeletal	2	0	39	Body Marks,Scars,Tattoos	23	0
40	Skin,Lymphatics	3	0	41	Neurological	0	0
42	Psychiatric	3	23	43	Pelvic	0	0
45	Specific Gravity	0	2	45	Albumin	3	-
45	Sugar	2	-	45	Microscopic	0	-
46	X-Ray	0	0	47	Serology	0	0
51	Height	0	0	52	Weight	1	1
57	Blood Pressure (Sitting)	10	10	57	Blood Pressure (Recumbent)	0	-
57	Blood Pressure (Standing)	0	-	58	Pulse (Sitting)	0	0
58	Pulse (After Exer.	0	-	58	Pulse 2 Min. Exer.	0	-
58	Pulse (Recumbent)	0	-	58	Pulse 3 Min. Stand.	0	-
59	Distant Vision	10	3	60	Refraction	0	1
61	Near Vision	0	2	63	Accommodation	0	0
64	Color Vision	6	0	65	Depth Perception	0	0
66	Field of Vision	0	0	67	Night Vision	0	0
68	Red Lens Test	0	0	69	Intraocular Tension	0	0
71	Audiometer	6	0				

Figure 5 Medical Summary Report - SF-88

M E D I C A L S U M M A R Y R E P O R T

Form : SF-93 12 FEB 76

Total Applicants Processed : 82

	MEDICAL ITEM	ABNL	DISQ		MEDICAL ITEM	ABNL	DISQ
101	Tuberculosis Contact	0	0	102	Wears Glasses/Contact Lenses	5	1
103	Coughed up blood	0	0	104	Doesn't have vision in both eyes	1	0
105	Bleeding-injury/tooth extr.	1	0	106	Wears a hearing aid	0	0
107	Attempted suicide	0	0	108	Stutter or stammer habitually	0	0
109	Sleepwalker	0	0	110	Wears a brace/back support	0	0
111	Scarlet fever, erysipelas	1	0	112	Cramps in legs	1	0
113	Trick or locked knee	1	0	114	Rheumatic fever	0	0
115	Frequent indigestion	0	0	116	Foot trouble	0	0
117	Swollen or painful joints	0	0	118	Stomach,liver,or intest trble	1	0
119	Neuritis	0	0	120	Frequent or severe headache	0	0
121	Fall bladder or gallstones	0	0	122	Paralysis	0	0
123	Dizziness or fainting spells	0	0	124	Jaundice or hepatitis	0	0
125	Epilepsy or fits	0	0	126	Eye trouble	1	0
127	React or serum,drugs,medicine	2	0	128	Car,train,sea or air sickness	1	0
129	Ear,nose,or throat trouble	3	0	130	Frequent trouble sleeping	0	0
131	Hearing loss	0	0	132	Broken bones	3	0
133	Depression or excessive worry	1	0	134	Chronic or frequent colds	1	0
135	Tumor,growth,cyst,cancer	0	0	136	Loss of memory or amnesia	0	0
137	Severe tooth/gum trouble	1	0	138	Rupture/hernia	2	0
139	Nervious trouble of any sort	0	0	140	Sinusitis	0	0
141	Piles or rectal disease	0	0	142	Periods of unconsciousness	1	0
143	Hay fever	1	0	144	Frequent or painful urination	0	0
145	Head injury	0	0	146	Bed wetting since age 12	1	0
147	Skin diseases	0	0	148	Kidney stone/blood in urine	0	0
149	Thyroid trouble	0	0	150	Sugar or albumin in urine	0	0
151	Tuberculosis	0	0	152	VD-Syphillis,gonorrhea,etc	2	0
153	Asthma	0	0	154	Recent gain or loss of weight	0	0
155	Shortness of breath	0	0	156	Arthritis,Rheumatism,Bursitis	0	0
157	Pain or pressure in chest	1	0	158	Bone,joint or other deformity	0	0
159	Chronic Cough	0	0	160	Lameness	0	0
161	Palpitation/pounding heart	0	0	162	Loss of finger or toe	0	0
163	Heart trouble	0	0	164	Trick shoulder or elbow	0	0
165	Treated for female disorder	0	0	166	High or low blood pressure	0	0
167	Recurrent back pain	0	0	168	Change in menstrual pattern	0	0
169	Sensitive to chemicals,dust	0	0	170	Inability of certain motions	0	0
171	Unable to assume certain posit	0	0	172	Medically refused employment	0	0
173	Treated for mental condition	1	0	174	Denied life insurance	0	0
175	Had or advised to have oper.	4	0	176	Patient in a hospital	5	0
177	Other illnesses or injuries	3	0	178	Treated for minor illnesses	2	0
179	Rejected for military serv.	0	0	180	Mil. discharge-mental,phys,etc	3	0
181	Existing disability	0	0				

Figure 6 Medical Summary Report - SF-93

contains (a) the total number of out-of-tolerance medical measurements by item (SF 88, Block 44 through Block 72), (b) the total number of abnormal and disqualifying entries by item (SF 88, Block 18 through Block 43), and (c) the total number of history "yes" answers and their impact on processing by each entry in Block 9 through Block 25 of the SF 93.

Summary of Medical Data Base Approach

In summary, the Program Office established the following guidelines for data base development: (a) terminate all efforts to redefine medical standards; (b) terminate efforts that substantially increased the detail of medical data collection; (c) utilize AR 40-501 as the governing document for general acceptability standards; and (d) limit the contents of the medical data base to those items needed to complete the automated SF 88 and SF 93 and obtain statistics on abnormalities and disqualification.

Optimization of Physician Time

Use of Paramedics

Initial efforts to optimize physician time centered on the use of paramedics to replace physicians at the AFEES. A structured test was conducted at the Boston AFEES between May and August 1973 to evaluate the capability of paramedics to perform physician duties. The test was performed in three phases: (a) paramedic evaluation, (b) paramedic training, and (c) paramedic testing. In the first phase, paramedics were evaluated by a physician on their ability to perform a physical examination. In the second phase, the paramedics were trained by the physician. This training included reviews of key areas of examination, follow-up on deficiencies noted in phase one, a review of check-list and protocol of the test and actual examinations under direct observation by the physician. In the third phase, the para- medics performed

examinations on 200 individuals over a two-month period. The same individuals were examined independently by a Boston AFEES physician and the two results were compared.

This comparison showed no significant deficiencies in examinations performed by paramedics. The paramedics were more compulsive in their recording technique, noting more identifying marks, such as scars, tattoos, than the physician. The major fault of the experiment was the lack of major abnormal physical findings on the applicants tested. Most of the major medical findings were found through history of past treatment and required supporting data and physician judgment to determine significance.

During the test and in observations since then, it was found that the physician examines mostly healthy applicants. The ability to recognize pathological findings is dependent on seeing such findings periodically. While physicians at AFEES have many years of experience in recognizing pathological conditions, the paramedics do not. Therefore, even if the paramedics were trained to recognize signs of disease, that ability would diminish from disuse.

In order to compensate for lack of continuous pathological findings, changes in medical standards and testing practices and steady military turnover, continuous tutoring would be necessary by a physician. Furthermore, with the present environment of more qualified applicants than positions, a more selective examination can be given. This discrimination is best accomplished by a physician.

In addition to the above observations on the use of paramedics, HQ USAREC made a policy decision to replace active duty physicians with civilian physicians--in the main, retired military officers. This decision was based on an expected shortage of paramedics as well as military physicians. The recent increases in military physician salaries and

expensive malpractice insurance are making military physician duty more attractive, and we may see a reversal in military physician shortages.

As a result of the above observations, it is evident that although paramedics could perform medical exams on most of the applicants, they could not handle serious or unusual pathological findings without a physician and therefore a minimum of one physician is always required at the AFEES. Furthermore, use of paramedics would be counter-productive based on USAREC policy and current trends. For these reasons, additional efforts to change the AFEES manpower requirements to include some paramedics in the Automated AFEES were terminated, and no paramedics were included in the Automated AFEES design.

Automation of Textual Data Entry and Regulation Look-Up

Much of the data entered by a physician is textual expansion of items identified during the clinical evaluation, measurements recorded and history. In an effort to reduce physician time in completing the SF 88, provisions have been included to automatically print the SF 88 textual and disqualification data based on coded entries. This printing will occur prior to the physician seeing the SF 88 so he will only have to supplement the printed text. Simultaneously, this approach will produce typewritten SF 88's, thereby reducing time spent to read handwritten comments. Automatic printing of free text based on coded entry has only partially reduced physician effort. In many cases a physician puts free text on the clinical evaluation worksheet. In cases where this is extensive the physician rewrites the free text on the SF 88 negating any savings provided by automatic printing.

Throughout the collection of medical measurements, data is compared against AR 40-501. Flags (shown as a "*") are provided for those measurements found to be "out of limits"

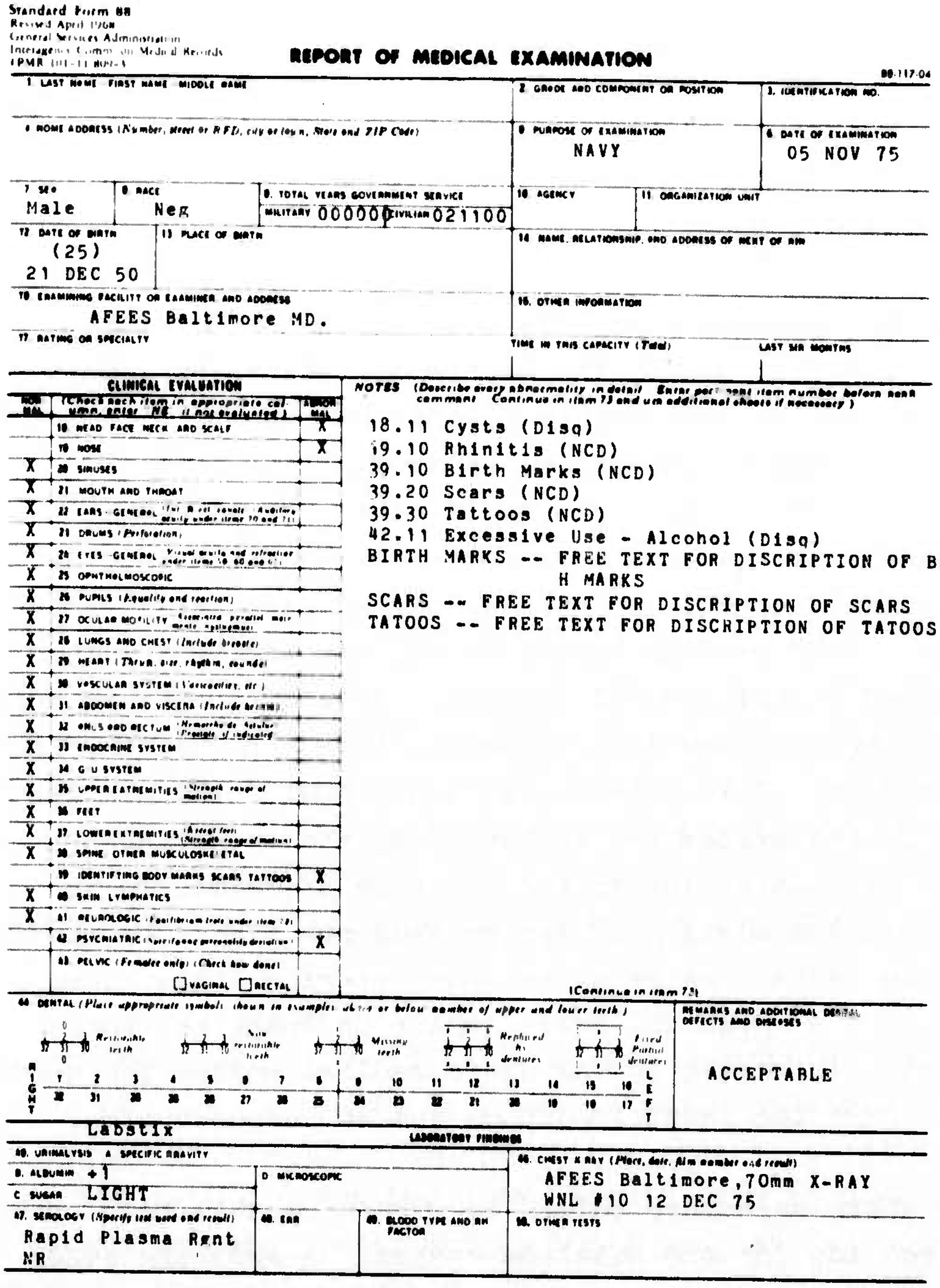
for acceptance into military service. Although this does not eliminate physician decision, it does reduce the time needed to check disqualifying limits. A sample of the printed SF 88 is shown in Figures 7 and 8.

Flexibility and Growth Considerations

Growth Considerations

Growth considerations were designed into the system initially as evidenced by the System Specification requirement, "the initial configuration shall be capable of a 50% expansion in memory, random access storage, peripheral devices and software by field modification." Although the system baselined for Baltimore increased over the initial configuration, the 50% expansion requirement is still being satisfied. With minimal modification, one additional terminal can be added to the Medical Section. By adding another multiplexer and appropriate line adapters, 16 additional terminals can be handled. Collectively, 17 additional terminals can be added to the system and supported by the operating system. The practical limitation to the addition of terminals is the possible degradation of system response time. No specific degradation factor can be given, but experience has shown that the RT02's cause the least impact on response time. Accordingly, increases in the basic medical collection hardware will have the least impact on system response time.

The above paragraph refers to growth capability of the medical section for the baseline system. A separate study was conducted regarding the expansion and contraction of the baseline system to handle different planned workloads. Included in this study is medical hardware configurations for the various workloads. For further information see ESD TR 76-129, Design Modularity Study for the Automated AFEES System by Lieutenant Arnold Reyes, et al.



Standard Form 88
Revised April 1968
General Services Administration
Interagency Comm. on Medical Records
FPMR 101-11.806-8

REPORT OF MEDICAL EXAMINATION

88-117-04

1. LAST NAME FIRST NAME MIDDLE NAME
2. GRADE AND COMPONENT OR POSITION
3. IDENTIFICATION NO.
4. HOME ADDRESS (Number, street or RFD, city or town, State and ZIP Code)
5. PURPOSE OF EXAMINATION: NAVY
6. DATE OF EXAMINATION: 05 NOV 75
7. SEX: Male
8. RACE: Neg
9. TOTAL YEARS GOVERNMENT SERVICE: MILITARY 000000 CIVILIAN 021100
10. AGENCY
11. ORGANIZATION UNIT
12. DATE OF BIRTH: (25) 21 DEC 50
13. PLACE OF BIRTH
14. NAME, RELATIONSHIP, AND ADDRESS OF NEXT OF KIN
15. EXAMINING FACILITY OR EXAMINER AND ADDRESS: AFEES Baltimore MD.
16. OTHER INFORMATION
17. RATING OR SPECIALTY
TIME IN THIS CAPACITY (Total) | LAST SIX MONTHS

CLINICAL EVALUATION

NORMAL	(Check each item in appropriate column, enter "NE" if not evaluated)	ABNORMAL
	18. HEAD, FACE, NECK, AND SCALP	X
	19. NOSE	X
X	20. SINUSES	
X	21. MOUTH AND THROAT	
X	22. EARS—GENERAL (Int. & ext. canals) (Auditory acuity under items 70 and 71)	
X	23. DRUMS (Perforation)	
X	24. EYES—GENERAL (Visual acuity and refraction under items 59, 60 and 67)	
X	25. OPHTHALMOSCOPIC	
X	26. PUPILS (Equality and reaction)	
X	27. OCULAR MOTILITY (Associated parallel movements, nystagmus)	
X	28. LUNGS AND CHEST (Include breasts)	
X	29. HEART (Thrust, size, rhythm, sounds)	
X	30. VASCULAR SYSTEM (Varicosities, etc.)	
X	31. ABDOMEN AND VISCERA (Include hernia)	
X	32. ANUS AND RECTUM (Hemorrhoids, fistulae) (Prostate, if indicated)	
X	33. ENDOCRINE SYSTEM	
X	34. G-U SYSTEM	
X	35. UPPER EXTREMITIES (Strength, range of motion)	
X	36. FEET	
X	37. LOWER EXTREMITIES (Except feet) (Strength, range of motion)	
X	38. SPINE, OTHER MUSCULOSKELETAL	
	39. IDENTIFYING BODY MARKS, SCARS, TATTOOS	X
X	40. SKIN, LYMPHATICS	
X	41. NEUROLOGIC (Equilibrium tests under item 72)	
	42. PSYCHIATRIC (Specify any personality deviation)	X
	43. PELVIC (Females only) (Check how done) ☐ VAGINAL ☐ RECTAL	

NOTES (Describe every abnormality in detail. Enter pertinent item number before each comment. Continue in item 73 and use additional sheets if necessary.)

18.11 Cysts (Disq)
19.10 Rhinitis (NCD)
39.10 Birth Marks (NCD)
39.20 Scars (NCD)
39.30 Tattoos (NCD)
42.11 Excessive Use - Alcohol (Disq)
BIRTH MARKS -- FREE TEXT FOR DISCRIPTION OF BIRT
H MARKS
SCARS -- FREE TEXT FOR DISCRIPTION OF SCARS
TATOOS -- FREE TEXT FOR DISCRIPTION OF TATOOS

(Continue in item 73)

44. DENTAL (Place appropriate symbols shown in examples above or below number of upper and lower teeth.)
Restorable teeth | Non-restorable teeth | Missing teeth | Replaced by dentures | Fixed Partial dentures
RIGHT | LEFT

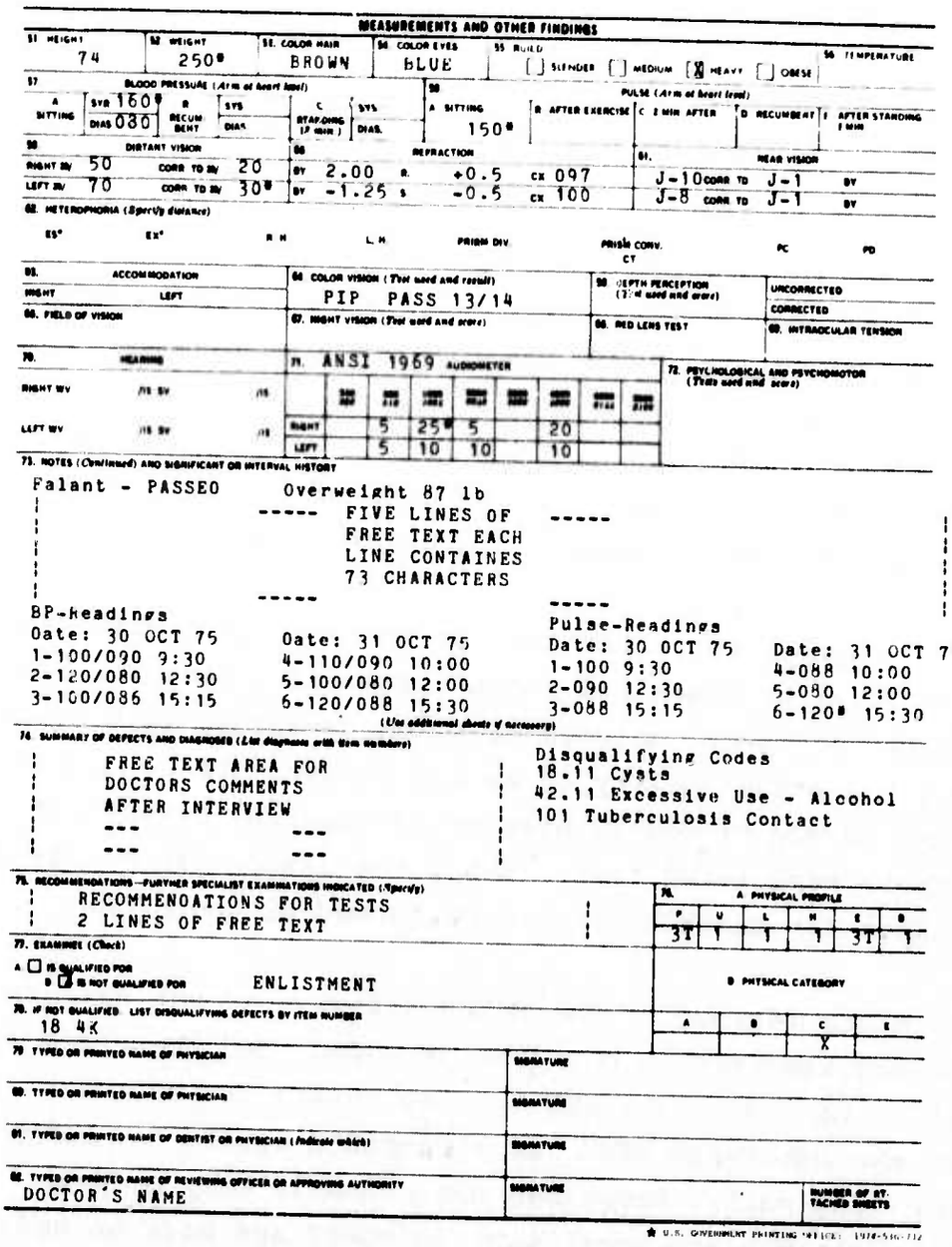
REMARKS AND ADDITIONAL DENTAL DEFECTS AND DISEASES: ACCEPTABLE

Labstix

LABORATORY FINDINGS

45. URINALYSIS: A. SPECIFIC GRAVITY
B. ALBUMIN: +1
C. SUGAR: LIGHT
D. MICROSCOPIC
46. CHEST X-RAY (Place, date, film number and result): AFEES Baltimore,70mm X-RAY WNL #10 12 DEC 75
47. SEROLOGY (Specify test used and result): Rapid Plasma Rgnt NR
48. EKG
49. BLOOD TYPE AND RH FACTOR
50. OTHER TESTS

Figure 7 Automated SF-88 Printout - Side 1



MEASUREMENTS AND OTHER FINDINGS

51 HEIGHT	52 WEIGHT	53 COLOR HAIR	54 COLOR EYES	55 BUILD	56 TEMPERATURE
74	250#	BROWN	BLUE	[ ] SLENDER [ ] MEDIUM [X] HEAVY [ ] OBESE	

57 BLOOD PRESSURE (Arm at heart level)

A SITTING	SYS 160#	B RECUMBENT	SYS	C STANDING (1 min)	SYS
	DIAS 080		DIAS		DIAS

58 PULSE (Arm at heart level)

A SITTING	B AFTER EXERCISE	C 1 MIN AFTER	D RECUMBENT	E AFTER STANDING 1 MIN
150#				

59 DISTANT VISION		60 REFRACTION			61 NEAR VISION	
RIGHT BV 50	CORR TO BV 20	BY 2.00	R +0.5	CX 097	J-10 CORR TO J-1	BY
LEFT BV 70	CORR TO BV 30#	BY -1.25	L -0.5	CX 100	J-8 CORR TO J-1	BY

62 HETEROPHORIA (Specify distance)

ES°	EX°	R H	L H	PRISM DIV	PRISM CONV. CT	PC	PD

63 ACCOMMODATION		64 COLOR VISION (Test used and result)	65 DEPTH PERCEPTION (Test used and score)	
RIGHT	LEFT	PIP PASS 13/14		UNCORRECTED
				CORRECTED
66 FIELD OF VISION		67 NIGHT VISION (Test used and score)	68 RED LENS TEST	69 INTRAOCULAR TENSION

70 HEARING		71 ANSI 1969 AUDIOMETER							72 PSYCHOLOGICAL AND PSYCHOMOTOR (Tests used and score)
RIGHT WV	/15 SV /15								
LEFT WV	/15 SV /15	RIGHT		5	25#	5		20	
		LEFT		5	10	10		10	

73 NOTES (Continued) AND SIGNIFICANT OR INTERVAL HISTORY

Falant - PASSED Overweight 87 lb

----- FIVE LINES OF FREE TEXT EACH LINE CONTAINES 73 CHARACTERS -----

BP-readings

Oate: 30 OCT 75
1-100/090 9:30
2-120/080 12:30
3-100/086 15:15

Oate: 31 OCT 75
4-110/090 10:00
5-100/080 12:00
6-120/088 15:30

Pulse-Readings

Date: 30 OCT 75
1-100 9:30
2-090 12:30
3-088 15:15

Date: 31 OCT 75
4-088 10:00
5-080 12:00
6-120# 15:30

(Use additional sheets if necessary)

74 SUMMARY OF DEFECTS AND DIAGNOSES (List diagnoses with item numbers)

FREE TEXT AREA FOR DOCTORS COMMENTS AFTER INTERVIEW

--- ---
--- ---

Disqualifying Codes
18.11 Cysts
42.11 Excessive Use - Alcohol
101 Tuberculosis Contact

75 RECOMMENDATIONS—FURTHER SPECIALIST EXAMINATIONS INDICATED (Specify)

RECOMMENDATIONS FOR TESTS
2 LINES OF FREE TEXT

76 A PHYSICAL PROFILE

P	U	L	H	E	S
31	1	1	1	31	1

77 EXAMINEE (Check)

A [ ] IS QUALIFIED FOR
B [X] IS NOT QUALIFIED FOR ENLISTMENT

78 IF NOT QUALIFIED LIST DISQUALIFYING DEFECTS BY ITEM NUMBER

18 4X

B PHYSICAL CATEGORY

A	B	C	E
		X	

79 TYPED OR PRINTED NAME OF PHYSICIAN	SIGNATURE	
80 TYPED OR PRINTED NAME OF PHYSICIAN	SIGNATURE	
81 TYPED OR PRINTED NAME OF DENTIST OR PHYSICIAN (Indicate which)	SIGNATURE	
82 TYPED OR PRINTED NAME OF REVIEWING OFFICER OR APPROVING AUTHORITY DOCTOR'S NAME	SIGNATURE	NUMBER OF ATTACHED SHEETS

★ U.S. GOVERNMENT PRINTING OFFICE: 1978-516-712

Figure 8 Automated SF-88 Printout - Side 2

Flexibility

A second feature designed into the system is flexibility. No basic input terminal, badge reader/data entry device (RT02) or CRT is hardware dedicated to a particular function and therefore can be transferred at will. RT02's can replace or supplement other RT02's as functions or workloads require. All that is needed is to initialize the RT02 with a pre-punched card defining the intended use. If it were necessary, CRT's can also be used to supplement or replace RT02's, but this is less desirable since medical data entry would be more complicated, CRT's are needed outside of the medical area and response time problems would occur if done extensively.

A significant capability of the Medical Section is the "out of limits" check and coding of medical data and text. Provision has been included to allow operators with correct access codes the ability to easily change "out of limits" values and add or modify history or clinical evaluation codes and their associated text. Thus, the system can easily adapt to changes in tests currently performed at the AFEES.

A key feature of the MUMPS software is the ease in which programs can be modified or added, and therefore the addition of tests like EKG or respiration is possible. However, the Automated AFEES is a complete system and programming of the nature described above should only be done by individuals who are proficient in MUMPS and have an understanding of the entire system.

One limiting factor in mobilization of an AFEES is the availability of trained medical technicians. There is no evidence that Automated AFEES can reduce the number of medical technicians needed to process the baseline workload. However, since the automated system flags "out of limits" data and prompts the operators regarding what medical data

must be entered, training of technicians for the AFEES is simplified and reaction to mobilization is improved.

Psychiatric and Psychometric Testing

Psychiatric Testing

Under the initial concept of Automated AFEES as expressed in the Program Management Plan, dated 15 Oct 73, the Air Force Human Resources Laboratory (AFHRL) would interface with the Program Office as follows:

a. Provide consultation to the Program Office concerning automation of data collection, storage and/or analysis (scoring) of psychometric* testing. *(For the purpose of this program, psychometric = aptitude = mental)

b. Recommend changes in content or technique of psychometric testing at the AFEES.

c. Assure appropriate interface with four-service effort to implement standard Armed Services Vocational Aptitude Battery (ASVAB) and the automated scoring capability at Randolph AFB.

d. Participate in the development and evaluation of applications programs relating to psychometric testing.

e. Participate in the integration and system test of psychometric testing component with the total system.

f. Participate with USAF/SAM in the evaluation of psychometric screening test being developed by Wilford Hall Medical Center for possible inclusion in the Automated AFEES.

In order to clarify the interface referenced above, a meeting was held between AFHRL and AMD/SAM on 12 Mar 74. As

a result of this meeting, it was established that the Program Office did not intend to be an advocate or test bed for developmental efforts, but rather a user of those projects that resulted in change to the operational AFEES. As such, it was necessary for the Program Office to be aware of AFHRL efforts but not be a designer or evaluator of new tests. With this intent agreed to, a new PMP dated 15 Oct 74 was printed that kept AFHRL as an advisor with no specific testing requirements.

Mental testing efforts can be broken into psychometric testing and psychiatric testing. The Program Office eliminated all efforts associated with developing a new psychiatric test since this effort was not part of AFEES current operation and out of the context of Automated AFEES objectives.

Psychometric Testing

Since the start of the contractual effort, psychometric testing requirements have fluctuated from needing Armed Forces Qualification Test (AFQT) and Army Classification Battery (ACB) to just ACB, and finally to only ASVAB VI and ASVAB VII. The last change (ACB to ASVAB VI and ASVAB VII) was implemented between operational site system test and IOT&E. The ACB was programmed by CSC to satisfy system testing requirements and analyze impacts of automating mental testing on the system. ASVAB VI and ASVAB VII was programmed by CSC for implementation during IOT&E. Continuous and close contact with AFHRL was necessary to introduce ASVAB VI and ASVAB VII with minimal schedule impacts. For both tests (ACB and ASVAB), the software provides the capability to calculate raw scores from worksheet scores and convert raw scores to standard scores.

Analysis of EPTS Discharges Due to Screening Deficiencies

Pre-All Volunteer EPTS Studies

A key issue in the formation of the Automated AFEES project was the fact that there was a significant Existed Prior to Service (EPTS) discharge rate with considerable cost to the Government. Existed Prior to Service discharges refer to those applicants who were enlisted into the service with a disqualifying defect and discharged at a later date due to the same defect. EPTS discharges are separated into the following classes for analysis. Class A--Could not have been detected at the AFEES; Class B--Might have been detected at the AFEES; Class C--Should have been detected at the AFEES; Class E--An erroneous discharge attributed to the service reception station; and Class U--Insufficient documentation to make one of the above determinations. Several reports had been written to describe this problem. The Philco Ford Feasibility Study, AMES System Plan - Final Report Volume 1, Executive Summary, dated 15 Oct 75, summarizes three Comptroller General reports, a HQ USAREC report and a USAF AMD study on the subject for the period between 1965 and 1970. In addition, Air Training Command (ATC) conducted a study on 2709 EPTS discharges for the same period and projected these results to national totals. The Air Force Office of the Surgeon General also conducted a study for the period November 1970 to October 1971.

The key findings and range of data for the above studies are summarized below.

a. The EPTS rate per total accessions ranged from 2.3% to 4.7%. The most recent study placed the rate at 2.8% for the Air Force.

b. Average cost per EPTS discharged ranged from $900 to $2581. The higher figure includes costs due to recruiting, training, disability, retired, and severance payments and benefits, and lost time and medical treatement caused by EPTS disability.

c. Between 8% and 35% of all EPTS discharges were due to missing or incorrect medical data (Class U).

d. Between 21% and 48% of all EPTS discharges could have been detected at the AFEES (Class B and C).

e. Between 6% and 22.8% of all EPTS discharges should have been detected at the AFEES (Class C). The 22.8% represents the latest Air Force study and was constant for each month tested.

This data is provided to scope the problem at the start of the program and to provide a basis to determine if "all volunteer" operations have improved EPTS rates. No projections are being made from this data regarding Automated AFEES.

All Volunteer EPTS Studies

Since January 1973 the military has been in an all volunteer posture. EPTS data for the "all volunteer" time period was provided by HQ USAREC, Systems Research and Analysis Division. This data provided EPTS rates nationally and for the Baltimore AFEES. It should be noted that EPTS discharges included in the study are based on when they are reported to HQ USAREC by the services. Therefore, you cannot conclude that all EPTS reported for a fiscal year are directly related to the same accessions for that fiscal year. A review of the data shows that three months after date of accession approximately 84% of all EPTS discharge data is obtained. Table 2 summarizes the data available for FY 74, FY 75 and seven months of FY 76. Data includes total accessions, total EPTS, total Class C EPTS and Class U EPTS for the Baltimore AFEES and nationwide. Table 3 shows the FY 76 EPTS data by month for the Baltimore AFEES. Besides monthly reported data, Table 3 includes cumulative EPTS discharges attributable to applicants processed in a specified month. In this way the impact of automation on EPTS discharges can be determined.

TABLE 2

ALL VOLUNTEER EPTS DISCHARGE DATA

		(1) Total Accessions	(2) Total EPTS	EPTS as % of Acc.	(2) Total Class C EPTS	Class C as % of Acc.	Class C as % of EPTS	(2) Total Class U EPTS	Class U as % of Acc.	Class U as % of EPTS
NATIONAL	FY 74	409,685	13,944	3.4	892	0.22	6.4	3066	0.74	21.6
	FY 75	442,931	12,848	2.9	949	0.20	7.4	3162	0.71	24.6
	FY 76	(5)290,020	8,070	2.8	699	0.24	8.7	3048	1.05	37.8
BALTIMORE AFEES	FY 74	(3) 8,984	273	3.04	14	0.16	5.1	(4)60	.67	22.0
	FY 75	(3) 11,444	269	2.35	24	0.21	8.9	78	.68	29.0
	FY 76	(5) 7,525	103	1.37	9	0.12	8.7	48	.64	46.6

NOTES: (1) Source: HQ USAREC, System Research and Analysis Division, Ft. Sheridan, ILL. Program 139-008

(2) Source: HQ USAREC, System Research and Analysis Division, Ft. Sheridan, ILL. Program 031-01

(3) Source: Baltimore AFEES, Linthicum Hts, MD

(4) July 1973 data not available.

(5) FY 76 contains 8 months of data

TABLE 3

FY 76 EPTS DATA FOR BALTIMORE AFEES

	(2) Total EPTS Reported in Month	(1,2) Total EPTS Enlisted in Month	(2) Total Class C EPTS Reported in Month	(1,2) Total Class C EPTS Enlisted in Month	(2) Total Class U EPTS Reported in Month	(1,2) Total Class U EPTS Enlisted in Month	(3) Total No. of Accessions in Month
JULY 75	10	20	0	0	4	11	909
AUG 75	3	16	0	1	1	5	990
SEPT 75	15	21	1	2	1	10	1084
OCT 75	2	23	0	1	0	11	1016
NOV 75	19	12	3	0	3	4	909
DEC 75	71	9	4	0	38	5	751
JAN 76	25	2	0	0	14	2	1019
FEB 76	16	0	1	0	6	0	847

NOTES: (1) Data is cumulative total of all EPTS enlisted in month specified - as of 29 Feb 76 report. For example 31 EPTS were reported since Baltimore was automated, however, only 2 were EPTS occurring in automated system while remaining 29 EPTS occurred in manual system prior to Jan 76.

(2) Source: HQ USAREC, System Research and Analysis Division, FT. Sheridan, ILL. Program 031-01

(3) Source: HQ USAREC, Production Control Division, Ft. Sheridan, ILL. Program 139-008

Medical System Analysis

Medical System Costs

In order to establish the cost of the medical section, an analysis was performed to determine the functions throughout the Automated AFEES that would be effected if automation of the medical section were deleted. Essentially, the badge readers and card punch would be eliminated and the CRT transferred to handle increased medical data entry needed for transmission. The cost of deleted hardware (including interface and core requirements) amounts to $49,132. Since the medical software has been developed, there would be minimal cost effect if it were duplicated for many AFEES or deleted altogether. Recurring costs due to the medical section (forms, badges and maintenance) would be about $9,500 per year.

Identifiable Cost Savings

The first identifiable benefits are due to the automatic printing of the SF 88. Based on reports from the Baltimore AFEES Medical Section, about three medical records per week are lost or misplaced before an applicant returns for additional medical processing or inspections. The current practice is to attempt to find the record, but if this can't be done quickly, perform the physical exam a second time. Since the medical data base is stored, a second printing would save approximately $3,900 per year (156 physicals @ $25.00) in duplicate physical examinations.

There is no significant paper cost savings attributable to reproduction of medical records vs. automatically printing multiple copies. However, based on Baltimore AFEES estimates, it takes approximately 1.5 man hours per day to duplicate the SF 88. Using an hourly rate of $3.50 and a 260-day work year, this represents a yearly savings of $1,365 provided by

the Automated AFEES because multipart forms are produced.

Potential Cost Savings

One significant potential cost benefit is the elimination or reduction of the records room. During operational evaluation it was observed that the records room is streamlining the amount of data maintained on applicants.

A significant reduction was due to the streamlining of required forms needed to process an applicant. Another reduction was due to shifting of some paperwork to the liaisons. Accordingly, during operational evaluation the information retained on file was medical results (SF 88, SF 93, X-ray and consultation letters) and mental test scores. In addition, the medical records were basically maintained until the applicant was processed into the service and then destroyed.

During operational evaluation the station made more use of the computer system to obtain medical records and became less dependent on the records room for medical data and is therefore receptive to data processing as a means of record storage.

The Baltimore AFEES estimate of the potential cost savings due to the elimination of the records room is approximately $16,360/year. This estimate includes $150.00 per month for envelopes and 16 man-hours per day at $3.50 per hour for 260 days per year It should be pointed out that the Baltimore AFEES is not in a position to attempt this immediately. The basic data (medical and mental records) are stored in the computer. However, much effort is required to handle applicants coming out of DEP and the whole process of scheduling applicants must be reevaluated.

Another extremely significant potential cost benefit is

the reduction of catchable EPTS disqualifications. Presently it costs the Government an average of $2,500 per EPTS discharge. Including identifiable cost savings above, the automated medical system must allow the Baltimore AFEES to reduce Class C EPTS from a yearly average of 19 (FY 74 & FY 75) to a yearly average of 14 in order to pay for itself in six years. No conclusion or prediction can be made based on the limited data available. In addition, fluctuations in monthly data dictates that the analysis must be based on a long-term average. The data supplied by USAREC (Tables 2 and 3) represents all available data at the completion of the operational evaluation period. Additional statistics should be collected for a year to make any valid statements concerning the benefits that medical automation could bring to the EPTS problem.

Intangible Benefits

There are several benefits associated with medical automation that cannot be quantified in terms of a dollar value.

The first benefit is the establishment of a medical data base that is computer compatible, accurate and updated daily. This data base along with associated reports provide information on the number of applicants processed daily, number of medical rejects and reasons, medical standards that cause increased workloads, etc. Through this data base, standards can be reviewed based on accurate, up-to-date data and decisions made regarding their relevance.

Although not programmed, there are many different analyses that could be performed if the prototype is nationalized. Examples are analyses to determine disqualification standards by geographical location or projections on the amount of accessions obtainable if a standard was raised.

It should be pointed out that within the Army, the Health

Information System and Biostatistics Agency performs a similar function for all services. That is, for all applicants who are disqualified, this agency reviews the applicant's SF 88 and codes the detailed reason for the disqualification. It is unlikely that medical summary reports or the coded data would be of any use to this agency, since they work directly from the SF 88's and code the data according to the International Classification of Diseases Adapted for use in the United States (ICDA, 8th revision). This code, although standard, is too complicated for AFEES operational use.

Although potential benefits exist due to the establishment and collection of a medical data base, the requirement was not generated by HQ USAREC, and they are not currently in a posture to collect this data other than obtaining a copy of the medical summary report from the Baltimore AFEES. Further, the collection of a medical data base is not part of the duties of an AFEES operation. In this context the hardware, software and additional duties required to collect and maintain the medical data base are superfluous to their current operation.

Based on the available EPTS data (Table 2) about 23% of known EPTS discharges cannot be determined. The main reasons for this are the non-availability of the SF 88 or SF 93 followed by missing or unintelligible information. Since the medical data base is stored for one year, it would be possible for agencies with a need to know to obtain a copy of the SF 88 or SF 93 directly from the originating source. In this way, many of the unknown classes can be determined, thereby providing a better picture of the nature of EPTS.

Aside from the quantifiable benefits of automatically printing the SF 88, the mere fact that a typewritten copy of the SF 88 is available provides a benefit to those persons or agencies who have to review this form. Experience has shown that there is significant time spent trying to read

and understand the handwritten SF 88's, but there is no available measure to determine how many agencies or people this would effect.

Another benefit is the flagging of out-of-tolerance data and the structured entry of medical data. Much of the savings is directly traceable to improved EPTS rates and must be studied further. A second benefit results from the reduced training requirement associated with the medical section. Experience has shown that minimal training is required to learn how to automatically enter medical data. The only remaining training is how to make medical measurements and recognizing "out of limits" data. Since "out of limits" data is flagged by the computer, less time would be needed to educate AFEES technicians and physicians on this AFEES specific function. Since the AFEES personnel were already experienced, no specific time savings could be attributed to this benefit.

During the evaluation of the manual and automatic systems, an applicant questionnaire was utilized to obtain some measure of applicant satisfaction or first service impressions. The questionnaire was administered to 346 applicants processed under the manual system. Essentially, this group of applicants indicated that they were treated with a high degree of courtesy and dignity by the medical staff. Approximately half the applicants indicated that they waited more than 10 minutes at one or more medical stations, and about 78% indicated a need for more medics. The medical areas of concern in order of most delays were: 44.5% - Physician Review, 31% - Vision, 30.3% - Hearing, and 21% - Medical Briefing.

The same questionnaire was received from 149 applicants processed with the automated system. In general, the applicant response was not as favorable for the automated system as it was for the manual system. Applicants indicated about

a 10% increase in confusion for the automated system and a 5% increase in non courteous treatment. Approximately 61% of the applicants indicated that they had to wait more than 10 minutes at one or more medical stations, and about 68% indicated a need for more medics. The medical areas of concern, in order of most delays were: Medical Briefing and Physicians Review both 42.4%, Vision - 41.0% and Hearing - 39.8% It should be pointed out that these areas were the problem areas for the manual system as well. The most significant difference between the manual and automated system was the medical briefing. This briefing, added during the automated evaluation, requires the applicants to wait until the history can be given to a large group. Previously, the groups were smaller and the history was not a part of the briefing. With the exception of the physicians review and the medical briefing, all medical stations in the automated system were identified 4% to 10% more times as causing delays greater than ten minutes. Much of the confusion and delays identified are undoubtly due to the fact that a new system with different operational procedures was being introduced along with an abnormally high workload in contrast to station manning. However, the data available to date indicates that applicant satisfaction is not being improved in the medical section and may in fact be hindered. Additional verification of applicant satisfaction should be obtained after the system has been in operation for one year.

Although this paper deals with the medical system, the Automated AFEES was designed as a totally integrated system. As such activities performed in the medical section are intended to help in later AFEES processing. For an example, the profile, medical disqualifying codes and height/weight data are required in the medical area and transmission room. Since they are entered in the medical area this effort is eliminated from the transmission room. In addition by limiting the data entered to related areas, necessary security is built in, i.e., the medics enter medical data, mental testing

personnel enter mental test data, etc..

Medical Processing Refinements

During the operational evaluation, two issues surfaced in relation to the automation of the medical section. The first relates to the speed of the SF 88 printer and the second refers to the entry of free text data.

Depending on the processing load and the amount of activity on the remainder of the system, it was observed that the printing of the SF 88 contributed a delay to completion of medical processing for the last applicant. That is, the first applicant processed through the automated medical system would not be processed any faster manually but the last applicant could have been processed a maximum of 30 minutes faster under the manual system. Although the 30 minutes delay is undesirable, observation of the liaison operation indicated that it was not likely that saving the 30 minutes for the last applicants would insure that they would be processed to completion any quicker. This was especially evident for the Army, which represents the largest workload to the AFEES. On days when the workload was large (85-105 physicals) and the printer caused the most delay, it was also observed that applicants were continuously waiting for their meeting with the liaison officer. New operational procedures have been instituted by the Baltimore AFEES and the liaisons to successfully eliminate the delay caused by the printer.

Although operational procedures have been developed to eliminate the loss of time to some applicants due to printer delays, it is possible that software modifications and an additional printer could reduce the waiting time to a more acceptable level.

As indicated previously, the entry of textual data based on physician comments is a function added by automation.

The purpose of this requirement is to insure the medical data base is current for all applicants processed by the AFEES. The driving force for current data is to insure that future SF 88's printed on an applicant contain all the information contained in the original SF 88.

The main advantage of printing a second SF 88 is the elimination of performing additional physicals due to lost records. As long as the basic measurements, disqualifying codes and profile were entered the first time, it would be unnecessary to perform an additional physical. Further, the SF 88 that leaves the AFEES the first time contains hand-written free text comments and therefore free text entry does not have any impact on this process. Lastly, the free text data is not currently analyzed by computer and therefore has no bearing on the medical summary report.

The one place where free text entry would be necessary is when the records room was eliminated and no SF 88 was produced for applicants on the first visit. Although possible, the impacts of this approach on AFEES operations and subsequent locations where an applicant goes after processing would be altered extensively and would require significant modification disproportionate to the gains.

Accordingly, the approach of printing the SF 88 on the applicant on the first visit and adding the profile and disqualifying codes less free text after the physician interview appears to provide the most benefit with the least impact on technicians.

Medical Summary Report Analysis

As stated, the medical summary report provides a vehicle to analyze the adequacy of the data currently collected by the AFEES. Depending on the information needed, many different approaches can be used. One such analysis is shown in Appendix

B . This analysis centers on the fact that the basic role of the AFEES is to determine if an applicant is qualified for military service. Accordingly,. it is directed at the adequacy of questions or tests that have a high percentage of disqualification. For example, certain questions on the SF 93 (Attempted suicide, Neuritis, Paralysis) have zero or minimal abnormal indication and disqualification when answered affirmatively by the applicants. Thus, these questions (because of low incidence, coaching or not understanding the question) do not disqualify an applicant.

Based on medical summary data through 12 February 1976, a ranking has been provided for the SF 88 and SF 93 item numbers. Two tables for each form have been developed based on the number of applicant's abnormal responses and the number of actual disqualifications. As a result of this analysis a one page medical examination form was developed that contains all the pertinent medical examination and history questions.

CONCLUSIONS

Recommendations

The ultimate responsibility of this effort was to develop a prototype automated AFEES and selectively apply automation to various operations. Once this was completed, the automated system was evaluated in an operational environment and a final recommendation made.

Based on the quantifiable and intangible benefits identified, the automation of the medical section is recommended. The main factors effecting this recommendation are as follows:

a. Known yearly cost savings represent better than one-half of the yearly operating expenses due to automation.

b. A potential high payoff area exists in the reduction of EPTS. For example a reduction of five Class C EPTS discharges per year would pay for the medical automation within five years. This number could be reduced as the $2,500 cost per discharge estimate increases. Two factors that could contribute to EPTS reductions are that as accessions increase there is a larger sample to draw from and, secondly, as Class U cases are identified more information will be available to reduce now undefined EPTS.

c. Keeping the automated medical section will contribute to the possibility of eliminating or reducing the records room. The maximum expected cost savings could be $16,360 per year.

d. There are many benefits that effect other agencies (available data base and partially typewritten SF 88) that cannot be quantified.

e. Cost data presented in this report represent actual costs paid by the Government. The trend toward lower hardware

costs for equivalent functions and quantity buy savings associated with a nationalized system make the data presented herein conservative.

f. The prototype Automated AFEES was designed as an integrated system. Since the cost/benefit tradeoffs are close, the automated system would function more efficiently with all areas automated.

Design Recommendations

The following recommendations are provided to scope the extent of automation.

a. In order to insure integrity of sensitive data and reaction capability to a constantly changing environment, the following design requirements are a necessity:

(1) Semiautomatic checking of completeness of data.

(2) Automatic assignment of data to applicant's data base.

(3) Controlled access to applicant's data base.

(4) Flexibility in hardware assignment.

(5) Capability to modify the medical data base.

b. On-line collection of biometric data with off-the-shelf medical equipment is not justifiable on a cost/benefit basis.

c. Medical data entry is handled adequately with basic numeric entry keyboards for all stations except medical data review. This station requires alphanumeric capability to handle textual comments. All data entry devices must have

display, echo and positive identification capabilities built in or through software. Use of a badge appears to be the most practical means of insuring that data is related to the correct applicant.

d. Automatic routing of applicants would not improve medical processing throughput. More emphasis should be placed on facility layout, scheduling and technician flexibility to improve throughput.

e. Paramedics could handle the majority of physical exams, but they cannot be used without at least one full-time physician on station. Further, current trends show use of paramedics would be counter-productive, and therefore their use is not recommended.

f. The SF 93 (Medical History) should not be automatically printed. The basic capability of capturing history through a mark sense version adequately satisfies operational needs. Summary of SF 93 data must be available to satisfy medical review requirements.

g. The medical summary report presents data on abnormal medical data as well as disqualification data. As noted, an existing Army organization already collects disqualification data on applicants and it is possible that these reports may not aid this effort. However, the medical summary report also provides insight into the caliber of applicants entering into the service, the success of the SF 88 and SF 93 in determining applicant qualification and trends in medical processing results. The results to date (Appendix B) indicate that this report has merit and should be continued as part of the automated system.

h. Free text entry of SF 88 data is available in the system and should be retained to allow important items to be added to the data base. However, the benefit obtained versus

the effort suggests that free text entry should be by exception only and not a standard procedure.

i. The task of improving the SF 88 printing operation should be undertaken. The addition of another printer with necessary software modifications would be the easiest modification. It is estimated that this would save 15 to 20 minutes of the 30 minutes delay sometimes observed.

APPENDIX A

AUTOMATED AFEES

CLINICAL EVALUATION CODEBOOK

REVISION 1

2 DECEMBER 1975

(Previous Edition is Obsolete)

Instructions for Use of Clinical Evaluation Worksheet and Codebook

Purpose

The Clinical Evaluation Worksheet and Codebook were developed to provide a means of entering clinical data in computer compatible format. Once entered in this format, statistical analysis can be performed and SF88's can be printed with a considerable reduction in textual comments.

Code Structure

The code utilized is a five-character numeric code (XX.XX) structured on the Clinical Evaluation portion of the SF88. The first two characters correspond to the block number on the SF88. For example, 18.XX refers to "Head, Face, Neck and Scalp," which is item 18 on the SF88. The third numeric character refers to basic medical findings under the major SF88 heading. For example, in the code 18.50, the third character (5) refers to "Thyroid abnormality." The fourth numeric character further details the basic medical finding. For example, in the code 18.51, the fourth character (1) further defines "Thyroid abnormality" as "Enlarged." Any level (SF88 block number, basic medical finding or detailed medical finding) can be coded based on the physician's requirement to adequately define the medical finding.

Clinical Evaluation Codebook

The Clinical Evaluation Codebook is formatted according to the SF88 block numbers and contains allowable entry codes in the format described above. The codebook was developed by a physician and is based on a review of medical records at various AFEES and contains the majority of findings and details typical of young applicants attempting to enter the service. The codebook in no way attempts to categorize all possible findings and accordingly, it is possible that a finding not in the codebook is encountered. Two mechanisms are available to handle this difficulty. First, each block number has a code XX.01, "Other (Describe)." If a finding is identified that does not occur in the codebook, code XX.01 can be entered and the finding described in free text form. Secondly, space is provided after each level to allow the addition of codes. If an element occurs frequently enough to warrant addition to the codebook, it can be written in. Under this approach the code would also have to be added to the computerized medical data base.

Clinical Evaluation Worksheet

The Clinical Evaluation Worksheet (Figure A-1) is a one-page form to replace the SF88 as a source document to collect clinical evaluation data. Although the form may be usable in many AFEES, it was specifically designed to include the common findings of the Baltimore AFEES. The form is layed out in the order that the clinical evaluation is performed at Baltimore, i.e., categories of the Head, Lungs, Heart, Abdomen/Genitalia, etc. For each category there is a specific column entry for "Normal" and "Abnormal" thereby eliminating the chance of misunderstanding or questions on whether a category was forgotten. In this way the concept of a source document is maintained. Space is provided in the upper right hand side to indicate "all normal" rather than completing every "normal" block when this is appropriate. Under the section identified as "Abnormality" those elements commonly found in the Baltimore AFEES are specifically identified with their applicable code. When these elements are identified, it is unnecessary to check the codebook. For every category, provision is included for textual identification of an abnormality. When this occurs an appropriate code (found in the codebook) describing the text must be entered in the space provided. When possible, the block number portion of the code is preprinted on the form. On the extreme right there is a column entitled "Disqual." This column is used to indicate whether or not an abnormal finding is also disqualifying. The upper left hand corner provides space for applicant identification. This identification will be provided through a pre-printed label.

Operational Use

Prior to the start of the clinical evaluation, the applicant will place his gummed label with basic identification on a blank "Clinical Evaluation Worksheet." The actual clinical evaluation will be conducted by a physician or his designated representative. The physician will check the abnormal findings directly if included on the form or write the description in the appropriate category when no code is specified. In addition, the physician will indicate if an abnormality is disqualifying. Under this context an abnormality not classified as disqualifying will automatically be printed as abnormal only.

Once the worksheet is completed by the physician, it will be given to a medical technician or designated representative. This technician will be responsible for insuring that the clinical evaluation data is inputted into the system. Codes checked on the clinical evaluation worksheet directly will be entered via a badge reader/data entry

terminal. For textual data entered on the worksheet, the technician must use the codebook to find and enter the code that best describes the data. It is expected that use of the codebook will be minimal because of the structuring of the worksheet and repetitive nature of non-specified codes.

For textual data that is not codable, i.e., descriptions of scars, tattoos, unusual diseases, the technician must enter data in free text format on a CRT. This data can be entered any time but will usually occur after the final physician interview when the Physical Profile is entered into the system.

AFEES CLINICAL EVALUATION WORKSHEET

Applicant's Gummed Label _____ ALL NORMAL

	NORMAL	ABNORMAL	ABNORMALITY		DISQUAL.
EYES	___	___	Specify_____	Code____	___
EARS	___	___	___Scarring 23.20 ___Perforation 23.40	___Right	___
			___Redness 23.60 ___Drainage 23.70	___Left	___
			___Other (Specify)_____	Code____	___
MOUTH	___	___	___Braces 21.36 Other_____	Code 21.	___
THROAT	___	___	___ Specify_____	Code____	___
HEAD	___	___	___ Specify_____	Code____	___
FACE	___	___	___ Specify_____	Code____	___
NECK	___	___	___ Specify_____	Code____	___
SCALP	___	___	___ Specify_____	Code____	___
NOSE	___	___	___ Specify_____	Code____	___
LUNGS	___	___	___Wheezes 28.50		
			___Other (Specify)_____	Code 28.	___
HEART	___	___	___Murmurs 29.50		
			___Other (Specify)_____	Code 29.	___
ABDOMEN/ GENITALIA	___	___	___Hernia 31.70	___Right	___
			___Absent Testicles 34.13	___Left	___
			___Undescended Testicles 34.14		___
			___Other (Specify)_____	Code____	___
RECTUM	___	___	___Hemorrhoids 32.10		___
			___Other (Specify)_____	Code____	___
UPPER, LOWER EXTREMITIES/ FEET/SPINE	___	___	___Missing Fingers 35.40 ___Missing Toes 36.10		___
			___Flat Feet 36.20 ___High Arches 36.50		___
			___Scoliosis 38.11		___
			___Other (Specify)_____	Code____	___
SKIN	___	___	___Rash 40.10 Describe_____		___
			___Needle Marks 40.40 Describe_____		___
			___Scars 39.20 Describe_____		___
			___Tattoos 39.30 Describe_____		___
			___Acne 40.50		___
			___Other (Specify)_____	Code____	___
VASCULAR/ ENDOCRINE/ NEUROLOGICAL	___	___	Specify_____	Code____	___
PSYCHIATRIC	___	___	Specify_____	Code 42.	___
PELVIC	___	___	Specify_____	Code 43.	___

Figure A 1. AFEES Clinical Evaluation Worksheet

EXAMPLES

The following examples are provided to demonstrate the use of the worksheet and codebook.

Example 1

Use of Preprinted Codes with item abnormal but not disqualifying.

	NORMAL	ABNORMAL	ABNORMALITY	DISQUAL
UPPER, LOWER EXTREMITIES/ FEET/SPINE	—	✓	__Missing Fingers 35.40 __Missing Toes 36.10 ✓Flat Feet 36.20 __High Arches 36.50 __Scoliosis 38.11 __Other (Specify)_____ Code____	— — — —

In this example the applicant had flat feet, but it was not disqualifying. During the clinical evaluation, the physician checks off "Abnormal" and "Flat Feet" as shown. The technician would only enter "36.20" through the badge reader/data entry terminal.

Example 2

Use of Preprinted Codes with item abnormal and disqualifying.

	NORMAL	ABNORMAL	ABNORMALITY	DISQUAL
UPPER, LOWER EXTREMITIES/ FEET/SPINE	—	✓	__Missing Fingers 35.40 __Missing Toes 36.10 ✓Flat Feet 36.20 __High Arches 36.50 __Scoliosis 38.11 __Other (Specify)_____ Code____	— ✓ — —

In this example the applicant had flat feet which was disqualifying. As in Example 1, the physician would check off "Abnormal" and "Flat Feet." In addition, the physician would check off the "Disqual." block as shown. The technician would enter "36.20" as in Example 1. In addition, the technician would answer "yes" when the badge reader/ data entry terminal asks if code is disqualifying.

Example 3

Use of Preprinted Codes with Right or Left checked or written on worksheet.

	NORMAL	ABNORMAL	ABNORMALITY			DISQUAL.
EYES	___	___	Specify_____		Code____	___
EARS	___	✓	___Scarring 23.20	✓Perforation 23.40	✓Right	___
			___Redness 23.60	___Drainage 23.70	___Left	___
			___Other (Specify)_____		Code____	___
MOUTH	___	___	___Braces 21.36	Other_____	Code 21.	___
THROAT	___	___	___ Specify_____		Code____	___
HEAD	___	___	___ Specify_____		Code____	___
FACE	___	___	___ Specify_____		Code____	___
NECK	___	___	___ Specify_____		Code____	___
SCALP	___	___	___ Specify_____		Code____	___
NOSE	___	___	___ Specify_____		Code____	___

In this example the applicant has a perforated right ear drum. During the clinical evaluation, the physician would check off "Abnormal," "Perforation," "Right," and "Disqual." (if appropriate). The technician would look up the proper code in the codebook and enter the code "23.41" through the badge reader/data entry terminal. For ease of operations codes have been structured so "right" indications are odd numbers and "left" indications are even numbers.

Example 4

Use of textual entry with codes identified in codebook.

	NORMAL	ABNORMAL	ABNORMALITY		DISQUAL
LUNGS	—	✓	___ Wheezes 28.50		
			✓ Other (Specify) funnel breast	Code 28.14	—
HEART	—	—	___ Murmurs 29.50		
			___ Other (Specify)	Code 29.	—
VASCULAR/ ENDOCRINE/ NEUROLOGICAL	—	✓	Specify hyperthyroidism	Code 33.11	—

In this example the applicant has hyperthyroidism and Pectus excavatum (Funnel breast). During the clinical evaluation the physician would check off "Abnormal" and "Other (Specify)" for Lungs and "Abnormal" and "Specify" for Vascular/Endocrine/Neurological. The physician would also write in "Pectus excavatum" or "Funnel breast" and "hyperthyroidism" in the appropriate categories as shown. The technician would have to use the codebook to find the code that best identifies the text written by the physician. The basic titles on the right of the worksheet directs the technician to the appropriate pages in the codebook. In this example, the technician would enter the codes "28.14" for "Funnel breast" and "33.11" for "hyperthyroidism" through the badge reader/data entry terminal.

In the above example the code "33.11" was entered because the physician specified "hyperthyroidism." The code entered is based on the extent of specification indicated by the physician. If the physician felt it was only necessary to indicate "thyroid" as the Endocrine System abnormality, then the correct code would be "33.10."

Example 5

Use of free text entry with partial or no code available in the codebook.

	NORMAL	ABNORMAL	ABNORMALITY	DISQUAL
SKIN	___	✓	___Rash 40.10 Describe_____	___
			___Needle Marks 40.40 Describe_____	___
			✓Scars 39.20 Describe 2 inch right wrist	___
			___Tattoos 39.30 Describe_____	___
			___Acne 40.50	___
			___Other (Specify)_____ Code____	___
PSYCHIATRIC	___	✓	Specify severe antisocial attitudes Code 42.01	✓

In this example the applicant has a two-inch scar on the right wrist and severe antisocial attitudes. During the clinical evaluation, the physician would check off "Abnormal" and "Scars" under the major category of "Skin" and write in "2-inch scar right wrist" as shown. Under the major category of "Psychiatric" the physician would check off "Abnormal" and "Disqual." and write in "severe antisocial attitudes" as shown. In the case of scars, the technician would enter the code "39.20" (read directly from the worksheet) through the badge reader/data entry terminal. Next he would enter the code "42.01" (from the codebook) to indicate a psychiatric abnormality to be specified later. In addition to entering "42.01," the technician would answer "yes" when the badge reader/data entry terminal asks if the code is disqualifying.

Later in processing, the technician must enter the textual comments identified on the worksheet. The technician will enter "2-inch scar right wrist" and "severe antisocial attitudes" in free text format through a Beehive Super Bee (CRT) terminal. The CRT screen will identify the appropriate place to type in the data. It is expected that this type of entry will be minimal.

AUTOMATED AFEES

CLINICAL EVALUATION CODEBOOK

18. HEAD, FACE, SCALP, AND NECK (Corresponds to No. 18 on Form 88)

18.01 Other (Describe)

18.02 Records Requested

18.03 Consultation Needed

18.10 Deformities

18.11 Cysts

18.12 Scarring

18.20 Interference with wearing helmet or other military equipment

18.30 Enlarged nodes in neck

18.31 Tonsillar

18.32 Anterior cervical

18.33 Posterior cervical

18.34 Masses

18.40 Trachea deviated

18.50 Thyroid abnormality

18.51 Enlarged

18.52 Solitary nodule

18.53 Multiple nodules

19. NOSE (Corresponds to No. 19 on Form 88)

19. 01 Other (Describe)

19. 02 Records Requested

19. 03 Consultation Needed

19. 10 Rhinitis

19. 20 Rhinorrhea

19. 30 Nasal septum deviated

19. 40 Airway obstruction

19. 50 Nasal polyps

20. SINUSES (Corresponds to No. 20 on Form 88)

20. 01 Other (Describe)

20. 02 Records Requested

20. 03 Consultation Needed

20. 10 Tenderness over:

20. 11 Annal sinus

20. 12 Frontal sinus

20. 13 Ethnoid sinus

22. EARS - GENERAL (Corresponds to No. 22 on Form 88)

22.01 Other (Describe)

22.02 Records Requested

22.03 Consultation Needed

22.10 External otitis

22.11 Right 22.12 Left

22.20 Foreign body

22.21 Right 22.22 Left

22.30 Growths

22.31 Right 22.32 Left

22.40 Deformities

22.41 Right 22.42 Left

21. MOUTH AND THROAT (Corresponds to No. 21 on Form 88)

21. 01 Other (Describe)

21. 02 Records Requested

21. 03 Consultation Needed

21. 10 Lips, buccal mucosa, tongue, and/or breath

21. 11 Ulcerated lips

21. 12 Suggestive of squarnous cell cancer

21. 13 Abnormal buccal mucosa

21. 14 Tongue - enlarged

21. 15 Tongue - smooth

21. 16 Tongue - red

21. 17 Tongue - pale

21. 18 Breath - alcoholic

21. 19 Breath - foul

21. 20 Palate, uvula, pharynx and/or tonsils

21. 21 Clef palate

21. 22 Repaired palate

21. 23 Pharynx - inflamed

21. 24 Pharynx, mucopus present

21. 25 Tonsils - absent

21. 26 Tonsils - enlarged

21. 27 Tonsils - inflamed

21. 28 Tonsils - purulent

21. 30 Teeth and/or Gums

21. 31 Edentulous

21. 32 Partial plates

21. 33 Full dentures

21. 34 Too few teeth

21. 35 Caries

21. 36 Braces

21. 37 Pyorrhea

21. 38 Hypertrophic gums

23. DRUMS (Corresponds to No. 23 on Form 88)

23.01 Other (Describe)

23.02 Records Requested

23.03 Consultation Needed

23.10 Unable to visualize

23.11 Right 23.12 Left

23.20 Scarred

23.21 Right 23.22 Left

23.30 Retracted

23.31 Right 23.32 Left

23.40 Perforated

23.41 Right 23.42 Left

23.50 No light reflex

23.51 Right 23.52 Left

23.60 Erythematous (Redness)

23.61 Right 23.62 Left

23.70 Acute otitis media (Drainage)

23.71 Right 23.72 Left

23.80 Acute otitis media (Mucoid)

23.81 Right 23.82 Left

23.90 Acute otitis media (Pus)

23.91 Right 23.92 Left

24. EYES - GENERAL (Corresponds to No. 24 on Form 88)

24.01 Other (Describe)

24.02 Records Requested

24.03 Consultation Needed

24.10 Conjunctivitis

24.11 Right 24.12 Left

24.20 Arcus Senilus

24.21 Right 24.22 Left

24.30 Ptosis

24.31 Right 24.32 Left

24.40 Exophthalmus

24.41 Right 24.42 Left

24.50 Hordeolum (Sty)

24.51 Right 24.52 Left

24.60 Chalazion

24.61 Right 24.62 Left

25. OPTHALMOSCOPIC (Corresponds to No. 25 on Form 88)

25.01 Other (Describe)

25.02 Records Requested

25.03 Consultation Needed

25.10 Media

25.11 Cataracts - Right eye 25.12 Cataracts - Left eye

25.13 Corneal scar - Right eye 25.14 Corneal scar - left eye

25.20 Optic discs

25.21 Papilledema - Right eye 25.22 Papilledema - Left eye

25.23 Optic atrophy - Right eye 25.24 Optic atrophy - Left eye

25.25 Abnormal cupping - Right eye 25.26 Abnormal cupping - Left eye

25.30 Retinal vessels

25.31 Arteriolar narrowing - Right eye 25.32 Arteriolar narrowing - Left eye

25.33 Copper wiring - Right eye 25.34 Copper wiring - Left eye

25.35 Silver wiring - Right eye 25.36 Silver wiring - Left eye

25.37 AV notching - Right eye 25.38 AV notching - Left eye

25.39 Arterioles abnormally tortuous - Right eye 25.40 Arterioles abnormally tortuous - Left eye

25. OPTHALMOSCOPIC (Continued)

25. 50 Maculae

25. 51 Macular degeneration with pigment mottling & scar tissue - Right eye

25. 52 Macular degeneration with pigment mottling & scar tissue - Left eye

25. 60 Hemorrhages or Exudates

25. 61 Hemorrhages - Right eye

25. 62 Hemorrhages - Left eye

25. 63 Exudates - Right eye

25. 64 Exudates - Left eye

25. 65 Cotton wool patch - Right eye

25. 66 Cotton wool patch - Left eye

25. 67 Venous microaneurysms - Right eye

25. 68 Venous microaneurysms - Left eye

25. 70 Retinal elevation

25. 71 Dark color or melanoma - Right eye

25. 72 Dark color or melanoma - Left eye

25. 73 Light color - Right eye

25. 74 Light color - Left eye

25. 75 Right eye - transparent & wrinkled as of retinal detachment

25. 76 Left eye - transparent & wrinkled as of retinal detachment

26. PUPILS (Corresponds to No. 26 on Form 88)

26.01 Other (Describe)

26.02 Records Requested

26.03 Consultation Needed

26.10 Pupils detached

26.11 Right 26.12 Left

26.20 Pupils miotic

26.21 Right 26.22 Left

26.30 Pupils irregular

26.31 Right 26.32 Left

26.40 Pupils unequal

26.50 Pupil fails to react to light

26.51 Right 26.52 Left

27. OCULAR MOTILITY (Corresponds to No. 27 on Form 88)

27.01 Other (Describe)

27.02 Records Requested

27.03 Consultation Needed

27.10 Strabismus

27.11 Right eye deviates 27.12 Left eye deviates

27.20 Nystagmus horizontal

27.21 Right eye 27.22 Left eye

27.30 Nystagmus vertical

27.31 Right eye 27.32 Left eye

27.40 Glaucoma

28. LUNGS AND CHEST (Corresponds to No. 28 on Form 88)

28. 01 Other (Describe)

28. 02 Records Requested

28. 03 Consultation Needed

28. 10 Chest (Configuration and Symmetry)

28. 11 Barrel shaped

28. 12 Asymmetric

28. 13 Scolioti

28. 14 Pectus excavatum (Funnel breast)

28. 15 Pectus carinatum (Pigeon breast)

28. 20 Breasts

28. 21 Mass or masses

28. 22 Nipple discharge

28. 30 Lungs

Fremitus

28. 31 Increased fremitus

28. 32 Decreased fremitus

Percussion

28. 33 Hyperresonance

28. 34 Dull to percussion

28. 35 Diaphragm motion decreased

28. 40 Breath sounds

28. 41 Vesicular

28. 42 Broncho-vesicular breath sound

28. 43 Bronchial

28. 44 Amphoric

28. 45 Increased

28. 46 Diminished

28. 47 Absent

28. 48 Course rales or rhonchi

28. 49 Fine rales

28. 50 Expiratory wheezes

28. 51 Expiratory delay

28. 52 Pleural friction rub

29. HEART (Corresponds to No. 29 on Form 88)

29.01 Other (Describe)

29.02 Records Requested

29.03 Consultation Needed

29.10 Inspection of precordium

29.11 Systolic retraction

29.12 Abnormal pulsations

29.20 PMI

29.21 5th ICS

29.22 6th ICS

29.23 7th ICS

29.24 Not felt

29.25 Palpable thrill

29.30 Heart sounds

29.31 S-1 Accentuated

29.32 S-1 Impaired or Absent

29.33 S-2 Accentuated

29.34 S-2 Impaired or Absent

29.35 P-2 Accentuated

29.36 P-2 Impaired or Absent

29.37 P-2 Split

29.38 P-2 Absent

29.39 P-2 Fixed

29.40 P-2 Paradozically split

29.41 3rd sound present

29.42 4th (presystolic) sound present

29.43 Pericardial shock

29.44 Opening snap

29.45 Friction rub

29.46 Systolic click

29.47 Ejection

29. HEART (Continued)

29.50 Murmurs

- 29.51 Systolic
- 29.52 Pansystolic
- 29.53 Ejection
- 29.54 Continuous
- 29.55 Early diastolic
- 29.56 Mid-diastolic
- 29.57 Presystolic

29.60 Cardiac rhythm

- 29.61 Sinus tachycardia
- 29.62 Premature ventricular beat
- 29.63 Atrial fibrillation
- 29.64 Bradycardia
- 29.65 Paroxysmal tachycardia
- 29.66 Slowed by carotid stimulation

29.70 Arterial tension

- 29.71 Hypertension
- 29.72 Hypotension

29.80 Heart size

- 29.81 Enlarged

30. VASCULAR SYSTEM (Corresponds to No. 30 on Form 88)

30.01 Other (Describe)

30.02 Records Requested

30.03 Consultation Needed

30.10 Varicosities of legs

30.11 Mild

30.12 Moderate

30.13 Severe

30.20 Finger Clubbing

30.30 Cyanosis of Extremities

31. ABDOMEN AND VISCERA (Corresponds to No. 31 on Form 88)

31. 01 Other (Describe)

31. 02 Records Requested

31. 03 Consultation Needed

31. 10 Inspection

31. 11 Surgical scars

31. 12 (Abdomen) distended

31. 20 Bowel sounds

31. 21 Hypoactive

31. 22 Absent

31. 23 Hyperactive

31. 30 Organomegaly

31. 31 Liver - enlarged

31. 32 Liver - displaced down

31. 33 Liver - firm

31. 34 Liver - soft

31. 35 Liver - nodular

31. 36 Liver - tender

31. 37 Spleen - palpated - cm below costal margin

31. 38 Spleen - enlarged

31. 39 Spleen - hard

31. 40 Masses

31. 41 Describe location(s)

31. 42 Movable

31. 43 Fixed

31. 44 Soft

31. 45 Hard

31. 46 Tender

31. 47 Bruit

31. 48 Pulsatile

31. ABDOMEN AND VISCERA (Continued)

31. 50 Tenderness

31. 51 Generalized

31. 52 Localized

31. 53 Direct

31. 54 Rebound

31. 60 Muscle spasm

31. 61 Voluntary

31. 62 Generalized

31. 63 Localized

31. 70 Hernia

31. 71 Inguinal

31. 72 Femoral

31. 73 Umbilical

31. 74 Ventral

32. ANUS AND RECTUM (Corresponds to No. 32 on Form 88)

32.01 Other (Describe)

32.02 Records Requested

32.03 Consultation Needed

32.10 Hemmorhoids

32.11 External 32.12 Thrombosed

32.20 Anal fissure

32.30 Test for occult blood positive

32.40 Anal fistula

32.50 Condyloma

33. ENDOCRINE SYSTEM (Corresponds to No. 33 on Form 88)

33.01 Other (Describe)

33.02 Records Requested

33.03 Consultation Needed

33.10 Thyroid

33.11 Hyperthyroidism 33.12 Hypothyroidism

33.20 Diabetes mellitus

34 GU SYSTEM (Corresponds to No. 34 on Form 88)

34.01 Other (Describe)

34.02 Records Requested

34.03 Consultation Needed

34.10 Genitalia

34.11 Hypospadias

34.12 Epispadias

34.13 Absent testicle

34.14 Undescended testicle

34.15 Absent right testicle

34.16 Absent left testicle

34.17 Undescended right testicle

34.18 Undescended left testicle

34.19 Atrophic right testicle

34.20 Atrophic left testicle

34.21 Hydrocoele right testicle

34.22 Hydrocoele left testicle

34.23 Spermatocele right testicle

34.24 Spermatocele left testicle

34.25 Varicocele

34.26 Discharge

34.30 Prostate

34.31 Boggy

34.32 Firm

34.33 Stony hard

34.34 Nodules

34.35 Enlarged

34.40 Kidney

34.41 Stones

34.42 Hydronephrosis

34.43 Nephrectomy

34.44 Congenital abnormality

34.50 Urine

34.51 Proteinuria

34.52 Discolored

34.53 Hematuria

34.54 Pyuria

34.55 Bilirubin

34.56 Glycosuria

35. UPPER EXTREMITIES (Corresponds to No. 35 on Form 88)

35. 01 Other (Describe)

35. 02 Records Requested

35. 03 Consultation Needed

35. 10 Reduced Strength

35. 11 Right upper arm — 35. 12 Left upper arm

35. 13 Right lower arm — 35. 14 Left lower arm

35. 15 Right hand — 35. 16 Left hand

35. 20 Range of motion reduced

35. 21 Right arm — 35. 22 Left arm

35. 30 Joints

35. 31 Right shoulder dislocation — 35. 32 Left shoulder dislocation

35. 33 Right shoulder unstable — 35. 34 Left shoulder unstable

35. 35 Right elbow dislocation — 35. 36 Left elbow dislocation

35. 37 Right elbow unstable — 35. 38 Left elbow unstable

35. 39 Wrist swelling — 35. 40 Missing fingers

35. 41 Missing fingers right hand — 35. 42 Missing fingers left hand

35. 43 Right wrist swelling — 35. 44 Left wrist swelling

35. 50 Broken or Deformed

35. 51 Right shoulder — 35. 52 Left shoulder

35. 53 Right upper arm — 35. 54 Left upper arm

35. 55 Right elbow — 35. 56 Left elbow

35. 57 Right lower arm — 35. 58 Left lower arm

35. 59 Right wrist — 35. 60 Left wrist

35. 61 Right hand — 35. 62 Left hand

35. 63 Fingers

36. FEET (Corresponds to No. 36 on Form 88)

36.01 Other (Describe)

36.02 Records Requested

36.03 Consultation Needed

36.10 Missing toes

36.11 Right 36.12 Left

36.20 Pes planus (flat feet)

36.30 Broken or deformed feet

36.31 Right 36.32 Left

36.40 Broken or deformed toes

36.41 Right 36.42 Left

36.43 Hammer toes right 36.44 Hammer toes left

36.45 Claw toes right 36.46 Claw toes left

36.47 Hallux valgus right 36.48 Hallux valgus left

36.50 Pes cavus (high arches)

36.60 Corns

36.61 Right 36.62 Left

36.70 Plantars warts

36.71 Right 36.72 Left

37. LOWER EXTREMITIES (Corresponds to No. 37 on Form 88)

37.01 Other (Describe)

37.02 Records Requested

37.03 Consultation Needed

37.10 Reduced strength

- 37.11 Right upper leg
- 37.12 Left upper leg
- 37.13 Right lower leg
- 37.14 Left lower leg
- 37.15 Right foot
- 37.16 Left foot

37.20 Range of motion (ROM) reduced

- 37.21 Right leg
- 37.22 Left leg

37.30 Joints

- 37.31 Right knee swelling
- 37.32 Left knee swelling
- 37.33 Right knee unstable
- 37.34 Left knee unstable
- 37.35 Right ankle swelling
- 37.36 Left ankle swelling
- 37.37 Right ankle unstable
- 37.38 Left ankle unstable

37.40 Broken or Deformed

- 37.41 Right upper leg
- 37.42 Left upper leg
- 37.43 Right lower leg
- 37.44 Left lower leg
- 37.45 Right ankle
- 37.46 Left ankle
- 37.47 Right knee
- 37.48 Left knee

38. SPINE AND BACK (Corresponds to No. 38 on Form 88)

38.01 Other (Describe)

38.02 Records Requested

38.03 Consultation Needed

38.10 Spinal deformity

38.11 Scoliosis

38.12 Kyphosis

38.13 Slipped disc

38.14 Spondylolithesis

38.15 Spondylosis

38.20 Spinal tenderness

38.21 Cervical

38.22 Thoracic

38.23 Lumbosacral

38.30 Limitation of motion of spine

38.40 Fractured spine

39. IDENTIFYING BODY MARKS, SCARS, TATTOOS (Corresponds to No. 39 on Form 88)

39.01 Other (Describe)

39.02 Records Requested

39.03 Consultation Needed

39.10 Birth marks (Describe)

39.20 Scars (Describe)

39.30 Tattoos (Describe)

39.40 Moles (Describe)

39.41 Hemangioma

40. SKIN, LYMPHATICS (Corresponds to No. 40 on Form 88)

40.01 Other (Describe)

40.02 Records Requested

40.03 Consultation Needed

40.10 Rashes (Describe)

40.11 Pilonidal sinus - draining

40.12 Pilonidal sinus - inactive

40.13 Tinea versicolor

40.14 Ivy poisoning (ivy, oak, sumac)

40.15 Eczema

40.16 Psoriasis

40.17 Tinea corporis

40.18 Tinea cruris

40.19 Icthyosis

40.20 Lacerations (Describe)

40.30 Abnormal color or texture

40.31 Brownish-yellow spots

40.32 Purplish

40.33 Yellow

40.34 Paleness

40.35 Pallor

40.36 Excessive wet

40.37 Depigmentation

40.38 Excessive cold

40.39 Excessive heat

40.40 Needle marks and tracks

40.50 Acne

41. NEUROLOGICAL (Corresponds to No. 41 on Form 88)

41.01 Other (Describe)

41.02 Records Requested

41.03 Consultation Needed

41.10 Visual Fields

41.11 Decreased

41.20 Corneal response

41.21 Diminished

41.22 Absent

41.30 Vertical gaze

41.31 Upward conjugate gaze

41.32 Nystagmus on upward gaze

41.33 Convergence on near gaze

41.40 Muscle strength

41.41 Maximal hand grip reduced

41.42 Shoulder abduction at 90^{o} reduced

41.43 Cannot stand on tip toes

41.44 Cannot stand on heels

41.50 Reflexes

41.51 Radio-periosteal

41.52 Abdominal

41.53 Cremasteric

41.54 Patellar

41.55 Ankle jerk

41.56 Babinski

41.57 Hypoactive

41.58 Hyperactive

41.60 Convulsive disorders

42. PSYCHIATRIC (Corresponds to No. 42 on Form 88)

42.01 Other (Describe)

42.02 Records Requested

42.03 Consultation Needed

42.10 Excessive use of drugs

42.11 Alcohol

42.12 Narcotics

42.13 Amphetamines

42.14 Barbiturates

42.15 Cocaine

42.16 Cannabis sative

42.17 Other - Hypontics, sedatives, tranquilizers

42.18 Narcotics & amphetamines

42.19 Narcotics & barbiturates

42.20 Narcotics, amphetamines, barbiturates

42.21 Amphetamines & barbiturates

42.30 Schizophrenia

42.40 Adolescent adjustment reaction

42.50 Suicidal tendencies

42.60 Depression

42.70 Immature personality

42.80 Anxiety reaction

43. PELVIC (Corresponds to No. 43 on Form 88)

43.01 Other (Describe)

43.02 Records Requested

43.03 Consultation Needed

43.10 Genitalia

43.11 Vulvitis

43.12 Lichen sclerosis et atrophicus

43.13 Condyloma acuminata

43.20 Vagina

43.21 Vaginitis

43.22 Trichomonial

43.23 Monilial

43.24 Non-specific

43.30 Cervix

43.31 Erosion

43.32 Gross cervical neoplasm

43.33 Polypoid extension in cervical canal

43.40 Uterus

43.41 Infantile

43.42 Normal size

43.43 Enlarged

43.44 Normal position

43.45 Retroverted

43.46 Retroflexed

43.50 Adnexa

43.51 Abnormal

APPENDIX B

MEDICAL SUMMARY ANALYSIS

SF 88 Analysis

Table B 1 shows the source data for the SF 88 analysis. The data presented is a cumulative total of first visit full medical processing for 38 days between 18 December 1975 and 12 February 1976. Because of operational changes instituted during the reporting period some modification and explaination of the source data is necessary.

Prior to 21 January 1976 no female data was entered into the medical summary reports and therefore the total applicants processed must be reduced by 86 applicants to 2841.

As indicated in the paper abnormal responses (ABNL) are determined automatically for most tests and by the physician during the clinical evaluation for others. In addition, any abnormal responses noted after the basic exam were to be added during free text entry. In this context abnormals should always be greater than or equal to disqualifications (DISQ). A review of the data shows that nine SF 88 items have disqualifications greater than abnormals. The main cause for this descrepency is that during free text entry only the disqualifying codes were added and abnormal codes were not updated. Although noticed early in IOT&E this practice was allowed to continue since it pointed out those items and their magnitude identified by the physician or others after the basic exam. For example, item 42 - Psychiatric had 115 abnormals and 1022 disqualifications. This shows that the majority of Psychiatric abnormals and disqualifications are determined by the physician at the final interview or later in processing rather than during the basic examination. As another example, item 61 - Near Vision shows 0 abnormals and 63 disqualified. Because of the many variables in this test the automatic system does not determine an abnormal. Rather this

TABLE B 1

MEDICAL SUMMARY REPORT TOTALS

Form : SF-88 Date : 12 FEB 76

Total Applicants Processed : 2927 Total Days Processed : 38

	MEDICAL ITEM	ARNL	DISQ		MEDICAL ITEM	ARNL	DISQ
18	Head,Face,Neck and scalp	29	29	19	Nose	2	1
20	Sinuses	0	0	21	Mouth and Throat	33	14
22	Ears	1	1	23	Drums	2	1
24	Eyes	17	15	25	Opthalmoscopic	7	7
26	Pupils	1	1	27	Ocular Motility	5	6
28	Lungs and Chest	54	55	29	Heart	69	67
30	Vascular System	9	8	31	Abdomen and Viscera	46	42
32	Anus and Rectum	2	1	33	Endocrine System	9	8
34	G-U System	94	63	35	Upper Extremities	49	52
36	Feet	364	32	37	Lower Extremities	83	89
38	Spine,Other Musculoskeletal	51	32	39	Body Marks,Scars,Tattoos	1092	0
40	Skin,Lymphatics	119	38	41	Neurological	22	25
42	Psychiatric	115	1022	43	Pelvic	0	3
45	Specific Gravity	0	91	45	Albumin	26	-
45	Sugar	32	-	45	Microscopic	0	-
46	X-Ray	4	7	47	Serology	2	4
51	Height	0	0	52	Weight	76	70
57	Blood Pressure (Sitting)	364	296	57	Blood Pressure (Recumbent)	0	-
57	Blood Pressure (Standing)	3	-	58	Pulse-Sitting	56	30
58	Pulse-After Exer.	9	-	58	Pulse-2 Min. Exer.	0	-
58	Pulse-Recumbent	0	-	58	Pulse-3 Min. Stand.	0	-
59	Distant Vision	325	128	60	Refraction	4	9
61	Near Vision	0	63	63	Accommodation	0	0
64	Color Vision	132	1	65	Depth Perception	0	0
66	Field of Vision	0	0	67	Night Vision	0	0
68	Red Lens Test	0	0	69	Intraocular Tension	0	0
71	Audiometer	102	6				

determination is made by the physician and disqualifications noted. Hence no abnormal is ever identified.

The term disqualification (DISQ) refers to both temporary and permanently disqualified applicants. As such it provides a relative measure of additional work needed to process applicants. For example, item 57 Blood Pressure (sitting) has 364 abnormals and 296 disqualifications. The majority of the 296 disqualifications were temporary and required an additional two days of processing.

Table B 2 provides a ranking of SF 88 items based on frequency of abnormalities. In cases where disqualifications exceeded abnormalities the disqualification number was used for analysis. Besides the identification of the most common abnormalities encountered additional information regarding the health of applicants entering the service is presented in later paragraphs.

Equally important from the AFEES point of view are those items that have little impact on determining applicant qualification. A comparison of Table B 2 with the actual SF 88 shows that items 19, 20, 22, 23, 25, 26, 27, 30, 32, 33, 46, 47, 57 (all but sitting), 58 (all but sitting), 60, 63, 65, 66, 67, 68, 69 provide less than .5% abnormal indication for the applicants tested. Since the main function of the physical exam is to determine if applicants are qualified for military service, the data suggests that these items do not typically cause problems for the young population tested and physicians are spending time that could be used elsewhere. In the case of item 46, (X-ray) considerable time and money (technicians, equipment, film and radiologist) is expended to detect .2% of the population.

Table B 3 provides a ranking of SF 88 items based on frequency of disqualification. Althrough the overall order changes there is a high degree of correlation between those

TABLE B 2

SF-88 MEDICAL SUMMARY ANALYSIS - RANKING OF ABNORMAL FINDINGS

	SF-88 Item	% Abnormal of Total Sample	% Disqual. of Abnormal
39	Body marks, scars, tattoos	38.4	0.0
42	Psychiatric	36.0	*
36	Feet	12.8	8.8
57	Blood pressure (sitting)	12.8	81.3
59	Distant vision	11.4	39.4
64	Color vision	4.6	.7
40	Skin, lymphatics	4.2	32.0
71	Audio	3.6	5.9
34	G-U system	3.3	67.0
45	Specific gravity	3.2	*
37	Lower extremities	3.1	*
52	Weight	2.6	92.1
29	Heart	2.4	97.1
61	Near vision	2.2	*
58	Pulse (sitting)	2.0	67.8
28	Lungs and chest	1.9	*
38	Spine and musculoskeletal	1.8	62.7
35	Upper extremities	1.8	*
31	Abdomen and viscera	1.6	91.3
21	Mouth and throat	1.2	42.4
18	Head, face, neck, and scalp	1.0	100.0
41	Neurological	0.9	*
24	Eyes	0.6	88.2

TABLE B 3

SF-88 MEDICAL SUMMARY ANALYSIS - RANKING OF DISQUALIFICATION

	SF-88 Item	% Disqual. of Total Sample	% Disqual. of Abnormal
42	Psychiatric	36.0	*
57	Blood pressure (sitting)	10.4	81.3
59	Distant vision	4.5	39.4
45	Specific gravity	3.2	*
37	Lower extremities	3.1	*
52	Weight	2.5	92.1
29	Heart	2.3	97.1
51	Near vision	2.2	*
34	G-U system	2.2	67.0
28	Lungs and chest	1.9	*
35	Upper extremities	1.8	*
31	Abdomen/viscera	1.5	91.3
58	Pulse (sitting)	1.3	67.8
40	Skin and lymphatics	1.3	32.0
38	Spine and musculoskeletal	1.1	62.7
36	Feet	1.1	8.8
18	Head, face, neck and scalp	1.0	100.0
41	Neurological	0.9	*
24	Eyes	0.5	88.2
21	Mouth and throat	0.5	42.4

items identified in Table B 2 and Table B 3. Keeping in mind the requirements of the AFEES suggests that Table B 3 should have the most weight in determining the usefulness of the SF 88. For example, two items that are high on Table B 2 (item 39, Body marks, scars and tattoos and item 64, Color vision) do not occur on Table B 3. The most significant, item 39, had 1092 abnormal indications and 0 disqualifications. From the point of view of determining disqualification, this item provides no benefit and requires considerable time to record the data in both the manual and automated systems. In addition, since applicants receive another physical examination at the reception stations, collection of this data at an AFEES appears needless.

In addition to pointing out SF 88 items that do not have a significant number of disqualifications, the medical summary report also points out factors about the general health of the applicants entering the service. For example, item 36 (Feet) had 362 abnormals and 32 disqualifications. Thus greater than 10% of the applicants accepted for military service have some difficulty with their feet. If this were extended to a national basis it suggests that possibly medical staffs should be adjusted to satisfy this potential problem.

Although not as striking as the above example, approximately 5% of the applicants accepted for military service have abnormal color vision and 3% have skin disorders.

Two other examples of the general health of applicants entering the service can be determined by this medical summary report and information provided by the Baltimore AFEES. Item 42, Psychiatric, for the most part represents applicants who have used drugs. In the sample evaluated, approximately 36% were temporarily or permanently disqualified. For approximately the same period of time, only four applicants were permanently disqualified after medical consultation. Thus approximately 36% of those qualified for service have used

drugs to some degree.

The second example, item 57 (Blood pressure-sitting) had approximately 10% of the applicants tested, temporarily or permanently disqualified. For approximately the same period of time, only two applicants were permanently disqualified after two days of measurement. Thus approximately 10% of those applicants qualified for military service exhibited abnormal but not disqualifying blood pressure readings.

SF 93 Analysis

Table B 4 shows the source data for the SF 93 analysis. The data presented is a cumulative total of first visit full medical processing for 37 days between 19 December 1975 and 12 February 1976. In order to account for times when the mark sense history was not utilized "Total Applicants Processed" must be reduced by 296 applicants to 2631.

For the SF 93 "ABNL" represents a "yes" response by the applicant and "DISQ" represents a determination of temporary or permanent disqualification by the physician.

Table B 5 provides a ranking of SF 93 items based on frequency of abnormalities. It is obvious from this analysis that there are many questions that receive a positive response by the applicant and upon review by the physician are determined to be not disqualifying.

When the results of the SF 93 data are ranked according to disqualification, (Table B 6) it is found that there is no item that contributes greater the .72% disqualification based on the total sample tested. When the amount of time required to administer, review and collect this data is considered (two hours of technician time, one hour of physician time, and 40 minutes to an hour of applicant time) there appears to be strong justification that the SF 93 is not a significant

TABLE B 4

MEDICAL SUMMARY REPORT TOTALS

Form : SF-93 Date : 12 FEB 76

Total Applicants Processed : 2927 Total Days Processed : 37

MEDICAL ITEM	ABNL	DISQ	MEDICAL ITEM	ABNL	DISQ
101 Tuberculosis Contact	31	0	102 Wears glasses/contact lenses	461	0
103 Coughed up blood	28	1	104 Doesn't have vision in both eyes	21	0
105 Bleeding-injury or tooth extr.	29	0	106 Wears a hearing aid	3	2
107 Attempted suicide	5	2	108 Stutter or stammer habitually	26	2
109 Sleepwalker	43	2	110 Wears a brace or back support	5	2
111 Scarlet fever,erysipelas	13	0	112 Cramps in legs	164	0
113 Trick or locked knee	36	11	114 Rheumatic fever	11	2
115 Frequent indigestion	30	0	116 Foot trouble	108	8
117 Swollen or painful joints	116	6	118 Stomach,liver,or intest. trble	138	10
119 Neuritis	1	1	120 Frequent or severe headache	61	1
121 Gall bladder or gallstones	3	0	122 Paralysis	5	0
123 Dizziness or fainting spells	51	1	124 Jaundice or hepatitis	16	1
125 Epilespy or fits	5	3	126 Eye trouble	123	11
127 React to serum,drugs,medicine	107	5	128 Car,train,sea or air sickness	84	0
129 Ear,nose or throat trouble	510	1	130 Frequent trouble sleeping	65	3
131 Hearing loss	21	0	132 Broken bones	508	13
133 Depression or excessive worry	71	16	134 Chronic or frequent colds	69	0
135 Tumor,growth,cyst,cancer	82	10	136 Loss of memory or amnesia	18	3
137 Severe tooth or gum trouble	136	4	138 Rupture/hernia	97	4
139 Nervious trouble of any sort	59	17	140 Sinusitis	46	0
141 Piles or rectal disease	47	0	142 Periods of unconsciousness	17	3
143 Hay fever	129	1	144 Frequent or painful urination	31	5
145 Head injury	144	11	146 Bed wetting since age 12	20	3
147 Skin diseases	424	5	148 Kidney stone or blood in urine	31	12
149 Thyroid trouble	9	2	150 Sugar or albumin in urine	14	3
151 Tuberculosis	2	1	152 VD-Syphillis,gonorreah,etc	132	0
153 Asthma	59	19	154 Recent gain or loss of weight	156	0
155 Shortness of breath	53	3	156 Arthritis,Rheumatism,Bursitis	11	2
157 Pain or pressure in chest	85	3	158 Bone,joint or other deformity	48	5
159 Chronic cough	29	1	160 Lameness	3	0
161 Palpitation or pounding heart	19	1	162 Loss of finger or toe	9	0
163 Heart trouble	30	12	164 Trick shoulder or elbow	27	5
165 Treated for female disorder	0	0	166 High or low blood pressure	36	9
167 Recurrent back pain	30	6	168 Change in menstrual pattern	0	0
169 Sensitive to chemicals,dust,etc.	276	0	170 Inability of certain motions	272	0
171 Unable to assume certain positions	277	0	172 Medically refused empolyment	270	0
173 Treated for mental condition	330	11	174 Denied life insurance	274	0
175 Had or advised to have oper.	805	5	176 Patient in a hospital	890	5
177 Other illnesses or injuries	577	7	178 Treated for minor illnesses	289	1
179 Rejected for military service	108	0	180 Mil. discharge-mental,phys.,etc.	152	0
181 Existing disability	70	2			

TABLE B 5

SF-93 MEDICAL SUMMARY ANALYSIS - RANKING OF ABNORMAL FINDINGS

	SF-93 Item	% Abnormal of Total Sample	% Disqual. of Abnormal
176	Patient in a hospital	33.82	.56
175	Had or advised to have operation	30.59	.62
177	Other illnesses or injuries	21.93	1.21
129	Ear, nose or throat trouble	19.38	.19
132	Broken bones	19.31	2.56
102	Wears glasses or contact lenses	17.52	.00
147	Skin diseases	16.16	1.18
173	Treated for mental condition	12.54	3.33
178	Treated for minor illnesses	10.98	.34
171	Unable to assume certain positions	10.53	.00
169	Sensitive to dust, checmicals, etc.	10.49	.00
174	Denied life insurance	10.41	.00
170	Inability to perform certain motions	10.34	.00
172	Medically refused employment	10.26	.00
112	Cramps in legs	6.23	.00
154	Recent gain or loss of weight	5.93	.00
180	Military discharge-mental, physical, etc.	5.78	.00
145	Head injury	5.47	7.63
118	Stomach, liver or intestine trouble	5.24	7.24
137	Severe tooth or gum trouble	5.17	2.94
152	VD-syphillis, gonorrhea, etc.	5.02	.00
143	Hay fever	4.90	.77
126	Eye trouble	4.67	8.94

TABLE B 5 (Continued)

SF-93 MEDICAL SUMMARY ANALYSIS - RANKING OF ABNORMAL FINDINGS

	SF-93 Item	% Abnormal of Total Sample	% Disqual. of Abnormal
117	Swollen or painful joints	4.41	5.17
116	Foot trouble	4.10	7.40
179	Rejected for military service	4.10	.00
127	Reaction to serum, drugs, medicine	4.07	3.93
138	Rupture/hernia	3.69	4.12
157	Pain or pressure in chest	3.23	3.52
128	Car, train, sea or air sickness	3.19	.00
135	Tumor, growth, cyst, cancer	3.12	12.19
133	Depression or excessive worry	2.70	22.54
181	Existing disability	2.66	2.85
134	Chronic or frequent colds	2.62	.00
130	Frequent trouble sleeping	2.47	4.61
120	Frequent or severe headache	2.32	1.64
153	Asthma	2.24	32.20
139	Nervious trouble of any sort	2.24	28.81
155	Shortness of breath	2.01	5.66
158	Bone, joint or other deformity	1.82	10.42
141	Piles or rectal disease	1.78	.00
140	Sinusitis	1.75	.00
109	Sleepwalker	1.63	4.65
166	High or low blood pressure	1.37	25.00
113	Trick or locked knee	1.37	30.55
101	Tuberculosis contact	1.18	.00
144	Frequent or painful urination	1.18	16.13
148	Kidney stone or blood in urine	1.18	38.71
115	Frequent indigestion	1.14	.00
163	Heart trouble	1.14	40.00
167	Recurrent back pain	1.14	20.00
159	Chronic cough	1.10	3.44
105	Bleeding injury or tooth extraction	1.10	.00
103	Coughed up blood	1.06	3.57
164	Trick shoulder or elbow	1.03	18.52

TABLE B 6

SF-93 MEDICAL SUMMARY ANALYSIS - RANKING OF DISQUALIFICATIONS

	SF-93 Item	% Disqual. of Total Sample	% Disqual. of Abnormal
153	Asthma	.72	32.20
139	Nervious trouble of any sort	.65	28.81
133	Depression or excessive worry	.61	22.54
132	Broken bones	.49	2.56
148	Kidney stone or blood in urine	.46	38.71
163	Heart trouble	.46	40.00
145	Head injury	.42	7.63
173	Treated for mental condition	.42	3.33
113	Trick or locked knee	.42	30.55
126	Eye trouble	.42	8.94
118	Stomach, liver or intestine trouble	.38	7.24
135	Tumor, growth, cyst, cancer	.38	12.19
166	High or low blood pressure	.34	25.00
116	Foot trouble	.30	7.40
177	Other illnesses or injury	.26	1.21
117	Swollen or painful joints	.22	5.17
167	Recurrent back pain	.22	20.00

tool to detect disqualifications.

Since the sample is still small and only related to one AFEES a less stringent criteria of .22% disqualification of total sample was used to determine the most significant items. As can be seen in Table B 6 this identifies 17 of the 87 items as significant in determining disqualification. For the most part, these items also have a high percent disqualification of abnormals.

New Medical Evaluation Form

Based on the analysis performed on the SF 88 and SF 93 it was found that elimination of those items that did not produce significant disqualification could result in one medical form that would accomplish the functions of the history and medical examination. Figures B 1 and B 2 show a possible sample form that could be used in the AFEES. For the SF 88, the selection criteria was basically that the item had to provide greater than .5% disqualification of the total sample tested and greater than .5% abnormal indication based on the total sample tested. For the SF 93, the selection criteria was basically that the item had to provide greater than .2% disqualification of the total sample and greater than 1.0% abnormal indication based on the total sample tested.

Summary

The analysis described in the preceeding paragraphs is limited to one AFEES for a short period of time. As such, the striking trends identified need further verification before changes are finalized for a national system. In addition, this analysis is performed based on the present function of an AFEES to determine qualification for service rather than a collection point for medical statistics.

REPORT OF MEDICAL EXAMINATION

LAST NAME FIRST NAME MIDDLE NAME	DATE OF BIRTH	IDENTIFICATION NO.
HOME ADDRESS (Number, street or RFD, city or town, State and ZIP Code)	PURPOSE OF EXAMINATION	DATE OF EXAMINATION
SEX / RACE / TOTAL YEARS GOVERNMENT SERVICE: MILITARY / CIVILIAN	EXAMINING FACILITY OR EXAMINER, AND ADDRESS	

CLINICAL EVALUATION

NORMAL	(Check each item in appropriate column, enter NE if not evaluated)	ABNORMAL
	HEAD, FACE, NECK AND SCALP	
	MOUTH AND THROAT	
	EYES—GENERAL (Visual acuity and refraction under items 19, 20 and 21)	
	LUNGS AND CHEST (Include breasts)	
	HEART (Thrill, size, rhythm, sounds)	
	G-U SYSTEM	
	UPPER EXTREMITIES (Strength, range of motion)	
	FEET	
	LOWER EXTREMITIES (Except feet) (Strength, range of motion)	
	SPINE, OTHER MUSCULOSKELETAL	
	ABDOMEN AND VISCERA (Include hernia)	
	SKIN, LYMPHATICS	
	NEUROLOGIC (Equilibrium tests under item 21)	
	PSYCHIATRIC (Specify any personality deviation)	
	PELVIC (Females only) (Check how done) ☐ VAGINAL ☐ RECTAL	

NOTES (Describe every abnormality in detail. Enter pertinent item number before each comment. Continue in item 73 and use additional sheets if necessary.)

MEASUREMENTS AND OTHER FINDINGS

HEIGHT	WEIGHT	COLOR HAIR	COLOR EYES	BUILD
				☐ SLENDER ☐ MEDIUM ☐ HEAVY ☐ OBESE

BLOOD PRESSURE (Arm at heart level)		PULSE (Arm at heart level)	URINALYSIS: A. SPECIFIC GRAVITY	
A. SITTING	SYS	A. SITTING	B. ALBUMIN	D. MICROSCOPIC
	DIAS		C. SUGAR	

DISTANT VISION		REFRACTION			NEAR VISION	
RIGHT 20/	CORR. TO 20/	BY	S.	CX	CORR. TO	BY
LEFT 20/	CORR. TO 20/	BY	S.	CX	CORR. TO	BY

REPORT OF MEDICAL HISTORY

(THIS INFORMATION IS FOR OFFICIAL AND MEDICALLY-CONFIDENTIAL USE ONLY AND WILL NOT BE RELEASED TO UNAUTHORIZED PERSONS)

HAVE YOU EVER HAD OR HAVE YOU NOW (Please check at left of each item)

YES	NO	DON'T KNOW	(Check each item)	YES	NO	DON'T KNOW	(Check each item)	YES	NO	DON'T KNOW	(Check each item)
			Heart trouble				Kidney stone or blood in urine				"Trick" or locked knee
			High or low blood pressure				Recurrent back pain				Foot trouble
			Swollen or painful joints				Stomach, liver, or intestinal trouble				Nervous trouble of any sort
			Asthma				Broken bones				Depression or excessive worry
			Eye trouble				Tumor, growth, cyst, cancer				Head injury
							FEMALES ONLY: HAVE YOU EVER				Been treated for a female disorder
											Had a change in menstrual pattern

YES	NO	CHECK EACH ITEM YES OR NO. EVERY ITEM CHECKED YES MUST BE FULLY EXPLAINED IN BLANK SPACE ON RIGHT	
		Have you ever been treated for a mental condition? (If yes, specify when, where, and give details).	
		Have you ever had any illness or injury other than those already noted? (If yes, specify when, where, and give details.)	

I certify that I have reviewed the foregoing information supplied by me and that it is true and complete to the best of my knowledge.
I authorize any of the doctors, hospitals, or clinics mentioned above to furnish the Government a complete transcript of my medical record for purposes of processing my application for this employment or service.

TYPED OR PRINTED NAME OF EXAMINEE	SIGNATURE

Figure B-1 Potential Combined History and Examination Form, Sd. 1

Applicants statement of health and explaination of history items identified on other side.

(Use additional sheets if necessary)

NOTES (Continued) AND SIGNIFICANT OR INTERVAL HISTORY

(Use additional sheets if necessary)

SUMMARY OF DEFECTS AND DIAGNOSES (List diagnoses with item numbers)

RECOMMENDATIONS—FURTHER SPECIALIST EXAMINATIONS INDICATED (Specify)	A PHYSICAL PROFILE					
	P	U	L	H	E	S
EXAMINEE (Check) A. ☐ IS QUALIFIED FOR B ☐ IS NOT QUALIFIED FOR	B PHYSICAL CATEGORY					
IF NOT QUALIFIED, LIST DISQUALIFYING DEFECTS BY ITEM NUMBER	A		B		C	E

TYPED OR PRINTED NAME OF PHYSICIAN	SIGNATURE	
TYPED OR PRINTED NAME OF PHYSICIAN	SIGNATURE	
TYPED OR PRINTED NAME OF DENTIST OR PHYSICIAN (Indicate which)	SIGNATURE	
TYPED OR PRINTED NAME OF REVIEWING OFFICER OR APPROVING AUTHORITY	SIGNATURE	NUMBER OF ATTACHED SHEETS

Figure B-2 Potential Combined History and Examination Form. Sd. 2

Although data is currently collected in great detail (Appendix A), the medical summary reports represent the only tabulation effort programmed as part of Automated AFEES. Depending on the type analysis required additional software must be developed to satisfy user needs.